ATIA - 21(1)(a)

Date march 1/19

Program huddle.
- AA back.
- EP - [redacted]

AL - public event around submission
- finalists may be waiting for SCC
- SEC will need to put out a communication to all finalists
- ADDA - need more compliance

AA - catching up.

SH - assessment process
- critical path to launch
- minimal Δ - to guide
- ch 1, 6, 9.

KB - submission - test
-

mB -

JS - efforts on assessments
-

Page

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Bouchard, Kathleen (INFC)

From: Bouchard, Kathleen (INFC)
Sent: March 4, 2019 8:02 AM
To: 'Seto, David'
Cc: Baird, Matthew (INFC)
Subject: Smart Cities challenge - webinar presentations
Attachments: Webinar - Performance Measurement - Final.pdf; SCC Webinar - Cyber Security.pdf

Good morning David, hope you had a nice weekend ☺
In the spirit of sharing some additional info with you and the review team, I thought I might forward the two attached presentations. One is on outcomes based performance measurement and the other on cybersecurity. These decks were shared with finalists via webinars with the goal of answering questions we were getting related to outcomes based performance measures and to privacy considerations.

The information was not meant to be applied verbatim (or used for the evaluation), just as general guidance. This might be useful to you and the team to understand some of the finalists' thinking in drafting those specific chapters.

Kathleen

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AGENDA

- Finalist requirements related to performance Measurement
- Presentation on Outcomes Based Performance by Susan Snider, Senior Associate at E.S. Tunis and Associates Inc.
- Contribution Agreement
- Communications touch base
- Wrap-up and next steps

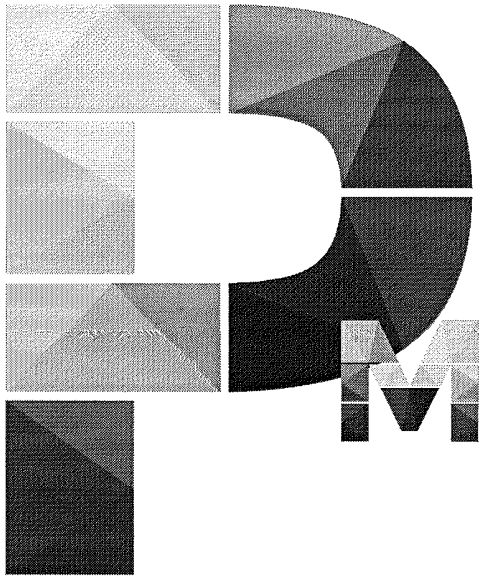
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Chapter 2 – Performance Measurement

Appendix 2

Links between project management and performance measurement

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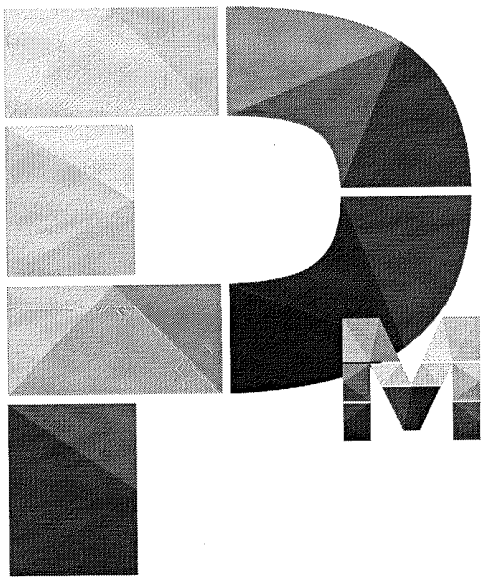


2018.11.29

OUTCOMES-BASED
Performance Measurement
SMART CITIES WEBINAR

SUSAN SNIDER
SENIOR ASSOCIATE
E.S. TUNIS AND ASSOCIATES INC.

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DESIGN PRINCIPLES

ASSUMPTIONS + RISKS

RESULTS + IMPACT

IMPLEMENTATION + SCHEDULING

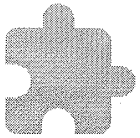
MEASURING PROGRESS TOWARD RESULTS

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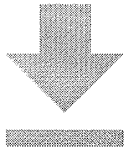
Design Principles

A technique to engage leaders in a strategic discussion about your approach to performance measurement and an opportunity to build a common mindset around the development of the performance measurement plan

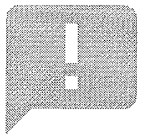
FOR EXAMPLE



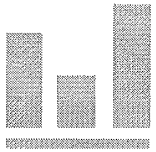
FIT FOR PURPOSE



MINIMUM VIABLE DATA



DATA STORYTELLING



VALUE ESTABLISHED SOURCES OF DATA

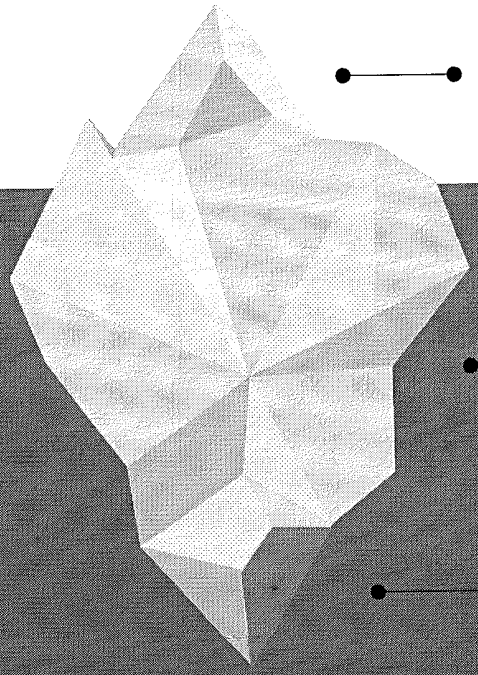


TIMING IS CRITICAL

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Results + Impact

Results are the achievements you expect to accomplish through the successful implementation of your project.



YOUR CHALLENGE STATEMENT

?

?

What additional results do you need to achieve to be successful?

A POINT OF CLARIFICATION:
RESULTS = OUTCOMES = GOALS = IMPACT

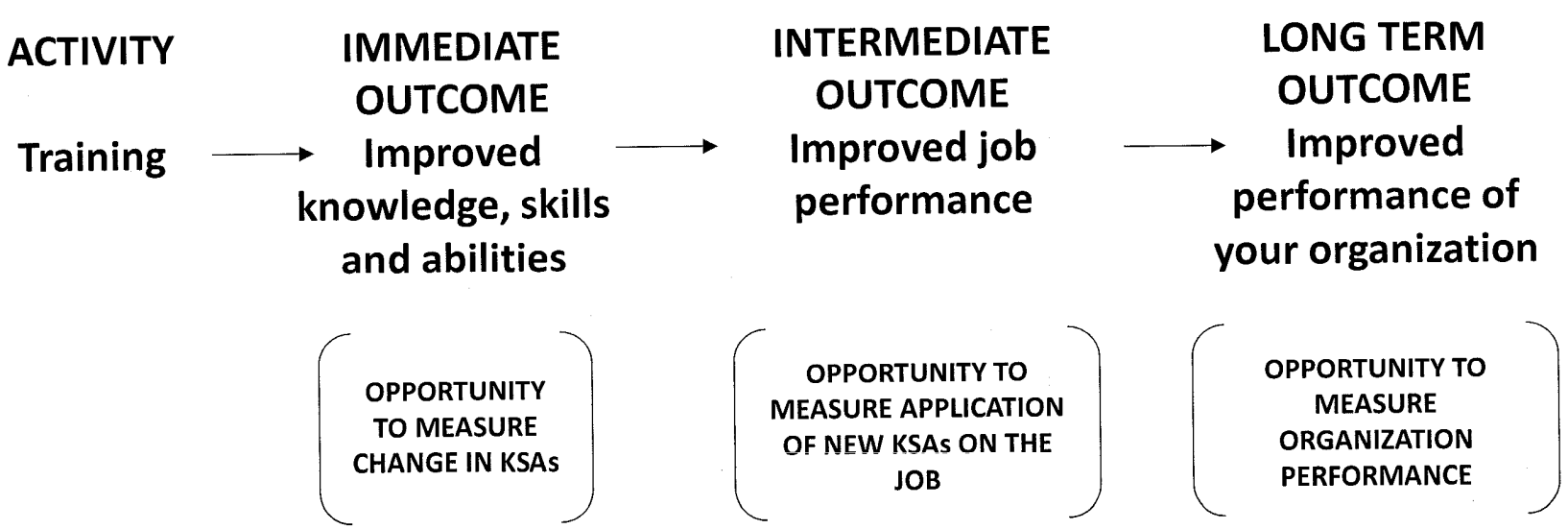
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IMMEDIATE OUTCOMES Changes we expect to occur	INTERMEDIATE OUTCOMES Changes we want to occur	LONG-TERM OUTCOMES Changes we hope will occur
Produce	Directly Influence	Contribute To
Project Control	Canadians, Government and/or Organizations Control	No Control
Accountable For	Manage Towards	Correct Logic
Full Attribution	Medium Attribution	Low Attribution
To or For Canadians, Government and/or Organizations	Canadians, Government and/or Organizations Use	Canadians, Government and/or Organizations Benefit
Measured Cyclically or at Project Completion	Measured at Project Maturity	Measured Over the Long Term
Tangible, practical results which are directly related to your project activities	**Changes which are occurring in communities as a result of successfully achieving immediate results**	**Longer-term changes to society**

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Results + Impact

FOR EXAMPLE … Think of the last time you participated in a conference, workshop or webinar



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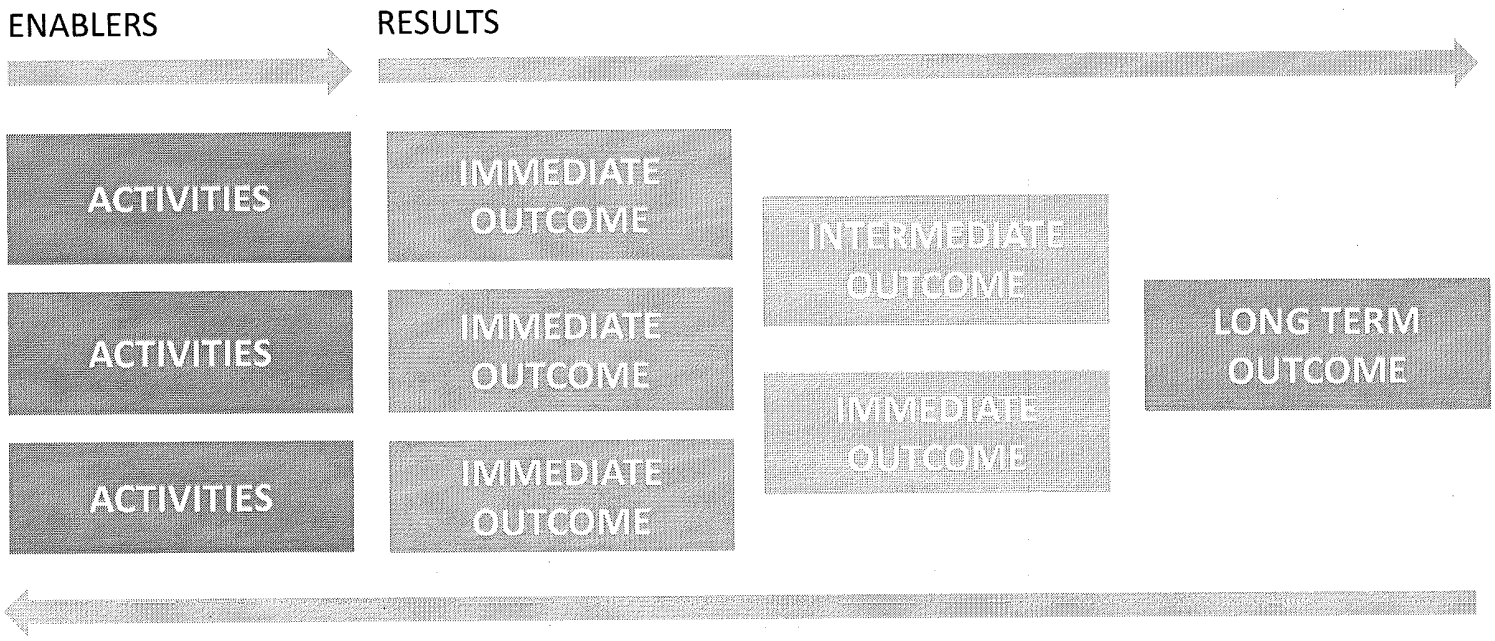
Creating Outcomes Statements

BEST PRACTICE ADVICE
Use words that show a change is underway

Improved … (knowledge, skills, ability …)
Increased … (awareness …)
Enhanced … (collaboration across a network …)
Greater … (supply of …)
Higher … (usage of …)
Diminished … (greenhouse gas emissions …)
Presence / Absence of …

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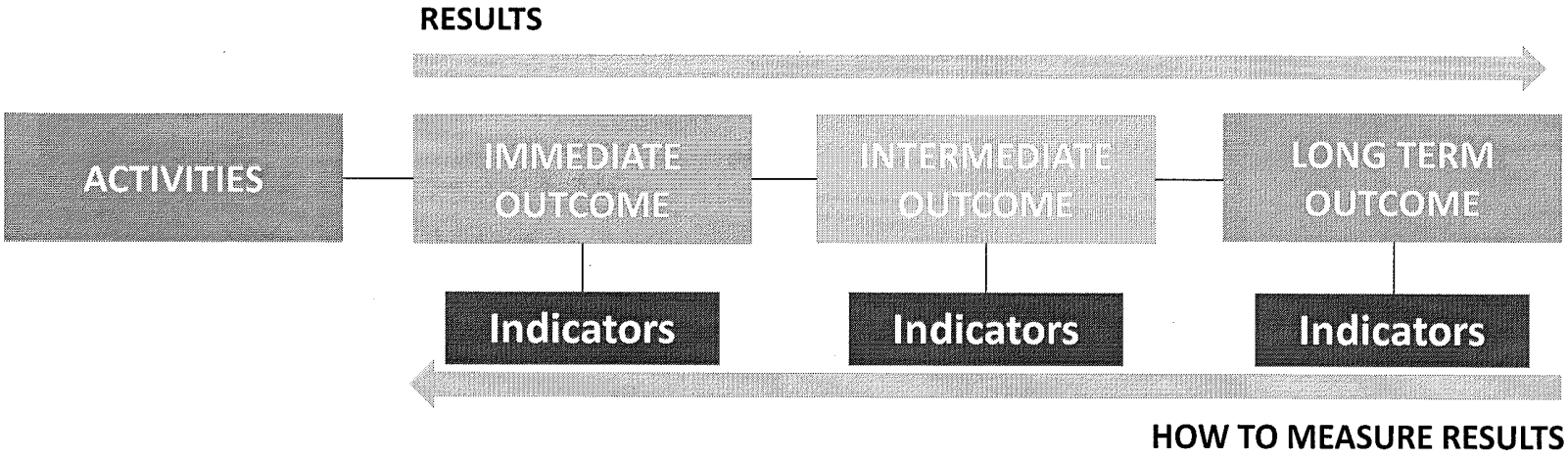
Building A Logic Model



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Measuring Progress Toward Results

An indicator is a measurement tool to determine progress toward an outcome or whether an expected outcome has been achieved



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Creating Indicators

BEST PRACTICE ADVICE
Both quantitative and qualitative indications can be equally valuable in measuring outcomes, and most performance measurement plans include a combination of both

For example, quantitative indicators can be directly counted & expressed as a number:

- **% of** … participants who are employed
- **# of** … women in decision-making positions
- **Frequency of** …
- **Ratio of** …
- **Amount of** …
- **Timeliness of** …

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Creating Indicators (Cont'd)

QUALITATIVE INDICATORS involve the measurement of perceptions, but can often be analyzed quantitatively.

Examples include:

- Congruence with …
- Satisfaction with …
- Knowledge of …
- Ability to …
- Appropriateness of…
- Importance of …
- **Level of …**

Qualitative indicators require further measurement criteria so that they can be used properly.

Example: **Level of citizen satisfaction**

Low | Citizens are not happy with any aspects of the product or service

Medium | Citizens are happy with some aspects but unhappy with others

High | Citizens are happy with all aspects of the product or service

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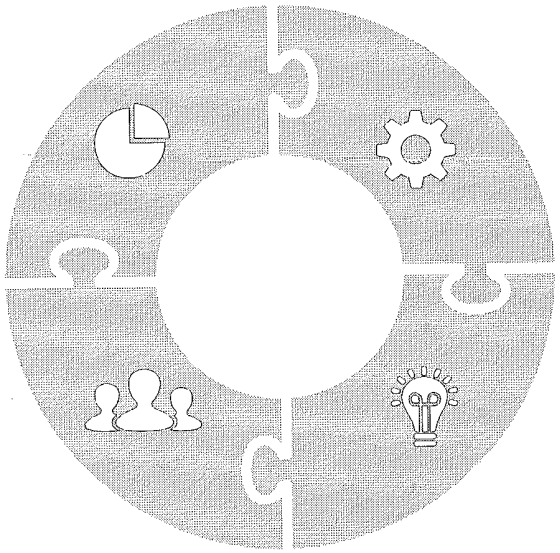
The Data Universe

WHAT IS REPORTED

Surveys
Focus groups
Program data
User generated data

WHAT PEOPLE DO

Mobile phone use
App Use
Postal traffic
Financial transaction records



WHAT SENSORS MEASURE

Weather sensors
Traffic cameras
Satellite and drone imagery
GPS records
Ambient sensors

WHAT PEOPLE SAY

Social media
Online news
TV and Radio
Blogs
Micro-narratives

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Baselines + Targets

A BASELINE is the minimum or starting point used to establish current performance, against which you can compare future performance to assess if change is really happening

A TARGET is the future state to which you aspire. Setting targets is a strategic planning exercise which captures how much change could or should occur.

A BENCHMARK AND A TARGET, WORKING TOGETHER, SHED LIGHT ON HOW MUCH CHANGE HAS ACTUALLY OCCURRED

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Definition		Example: Poverty
OUTCOME | A statement of intended change	**What result you want to achieve**	Reduce poverty in Canada
INDICATOR | Measurement device to measure intended change	**What you are going to measure**	Number of Canadians living in low income
BASELINE | State of performance at start of project	**Where you are today**	4.2 million Canadians as of 2015 (representing 12.1% of Canadians)
TARGET | Quantified level of performance to be attained by a certain date	**Where you want to be in the future**	3.36 million Canadians by 2020 and 2.1 million by 2030 (A 20% reduction from 2015 levels by 2020 and a 50% reduction from 2015 levels by 2030)
SUMMARY		Number of Canadians living in poverty reduced to 3.36 million by 2020 and reduced to 2.1 million by 2030 from 4.2 million in 2015

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Definition (Cont'd)

SUMMARY

METHODOLOGY | The rules, procedures and definitions guiding the collection of data

How you are going to treat the data

SOURCE OF DATA | How the data will be collected

Where the data is coming from

TIMING + FREQUENCY | When and how often the data will be collected and assessed

When the data will be available to support decision makers

Example: Poverty

Number of Canadians living in poverty reduced to 3.36 million by 2020 and reduced to 2.1 million by 2030 from 4.2 million in 2015

Market-basket measure (MBM): The measure of low income is based on the cost of a specific basket of goods and services representing a modest, basic standard of living. When the disposable income for the MBM of an individual falls below the applicable threshold, the person is considered to be in low income.

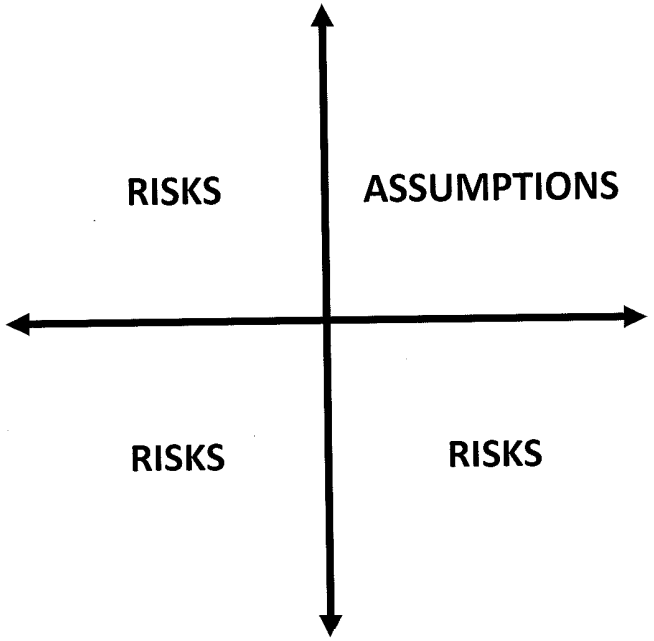
Statistics Canada, Census of Population, Market

Every five years (2021 & 2026), with data released within 18 months of data collection

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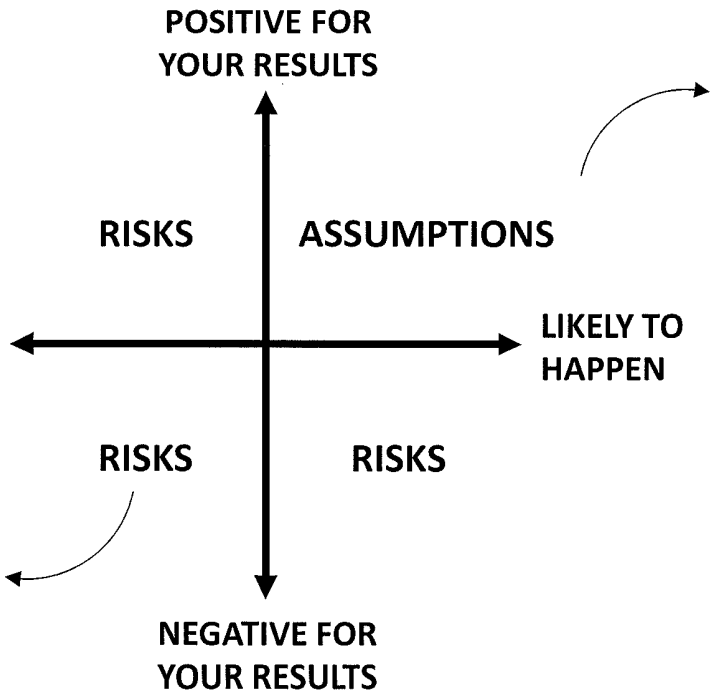
Assumptions + Risks

Throughout the process of building your performance measurement plan, you will undoubtedly come across areas in which you need to make certain ASSUMPTIONS. Similarly, your team will naturally start discussing the RISKS associated with various approaches you may take.



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Assumptions + Risks



Assumptions are typically external conditions essential to the achievement of expected results – it is "assumed" certain conditions or factors will be in place for the project to be a success

Risks can be viewed as external factors that can negatively affect the achievement of expected results – these are factors which can jeopardize the success of a project.

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Assumptions + Risks

BEST PRACTICE ADVICE
Consider asking the following questions ...

1. What are we **assuming** will happen or be in place in order to achieve our results?

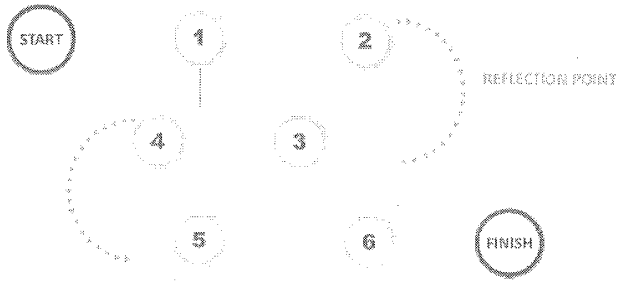
2. Is there any **risk** that certain key conditions could change or not be in place? | How serious is this risk? (high-medium-low?) | How probable is the risk? (high-medium-low?) | How can we mitigate these risks?

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Monitoring + Evaluation

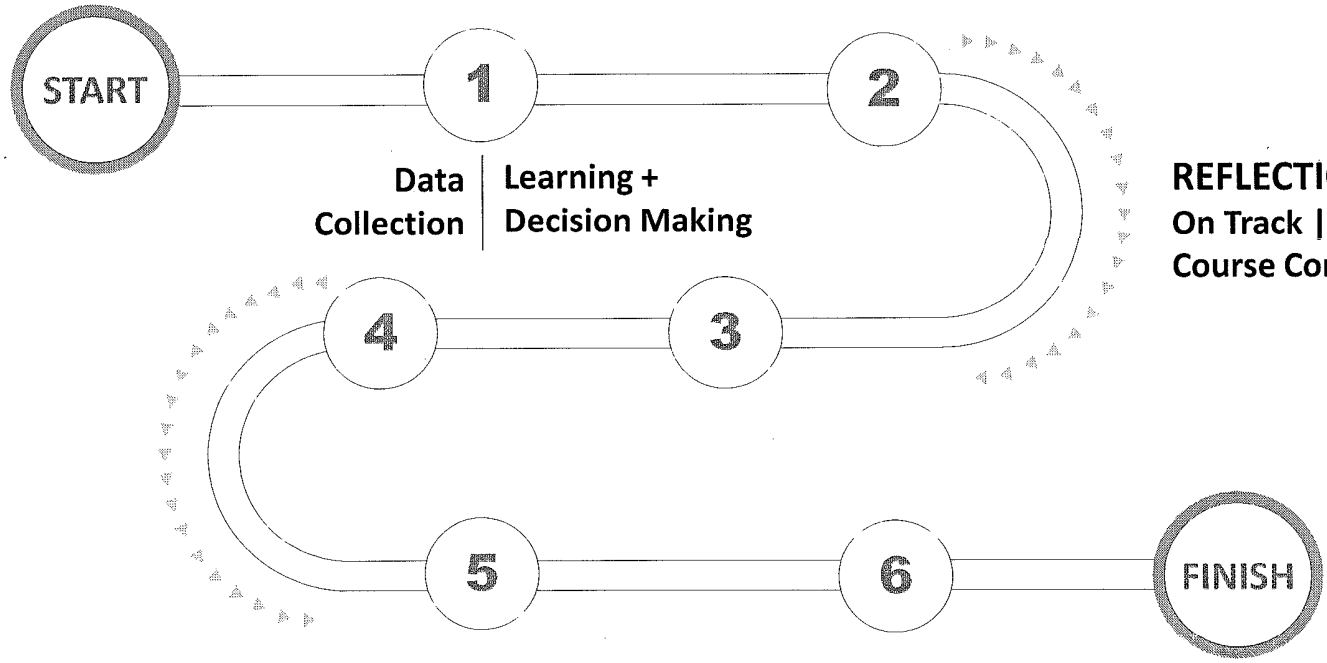
BEST PRACTICE ADVICE

Once you have developed data collection methods, and associated timing and frequency elements, you can now combine these into a monitoring and evaluation section to map out how all of these activities will be sequenced over the life of the project



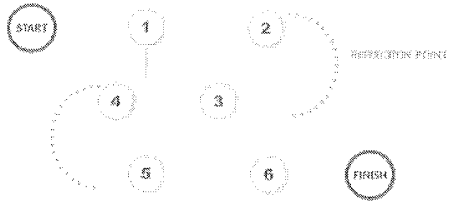
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Monitoring + Evaluation

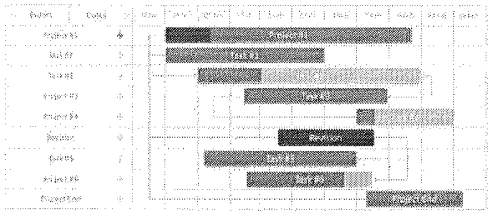


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Monitoring + Evaluation



+



QUESTIONS FOR YOUR CONSIDERATION:

Are you able to map high level project timelines, deliverables and milestones against the sequence and timing of data collection activities?

At what point in the project do you anticipate being able to assess the expected achievement of immediate, intermediate and long term outcomes?

Do you have opportunities built into the project to make course corrections or move through iterations if progress toward results is not as successful as you originally anticipated?

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Payment Schedule

A FINAL THOUGHT …

Think strategically about how you want to develop a payment schedule which links payments to outcomes

You have the freedom to be creative and innovative in how you develop your performance measurement plan and this in turn will set the foundation for a future contribution agreement

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Questions ?

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CONTRIBUTION AGREEMENT

- What is an outcomes-based contribution agreement?
- How will the final proposal components fit into a an outcomes-based contribution agreement?
- Considerations

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Communications touch-base

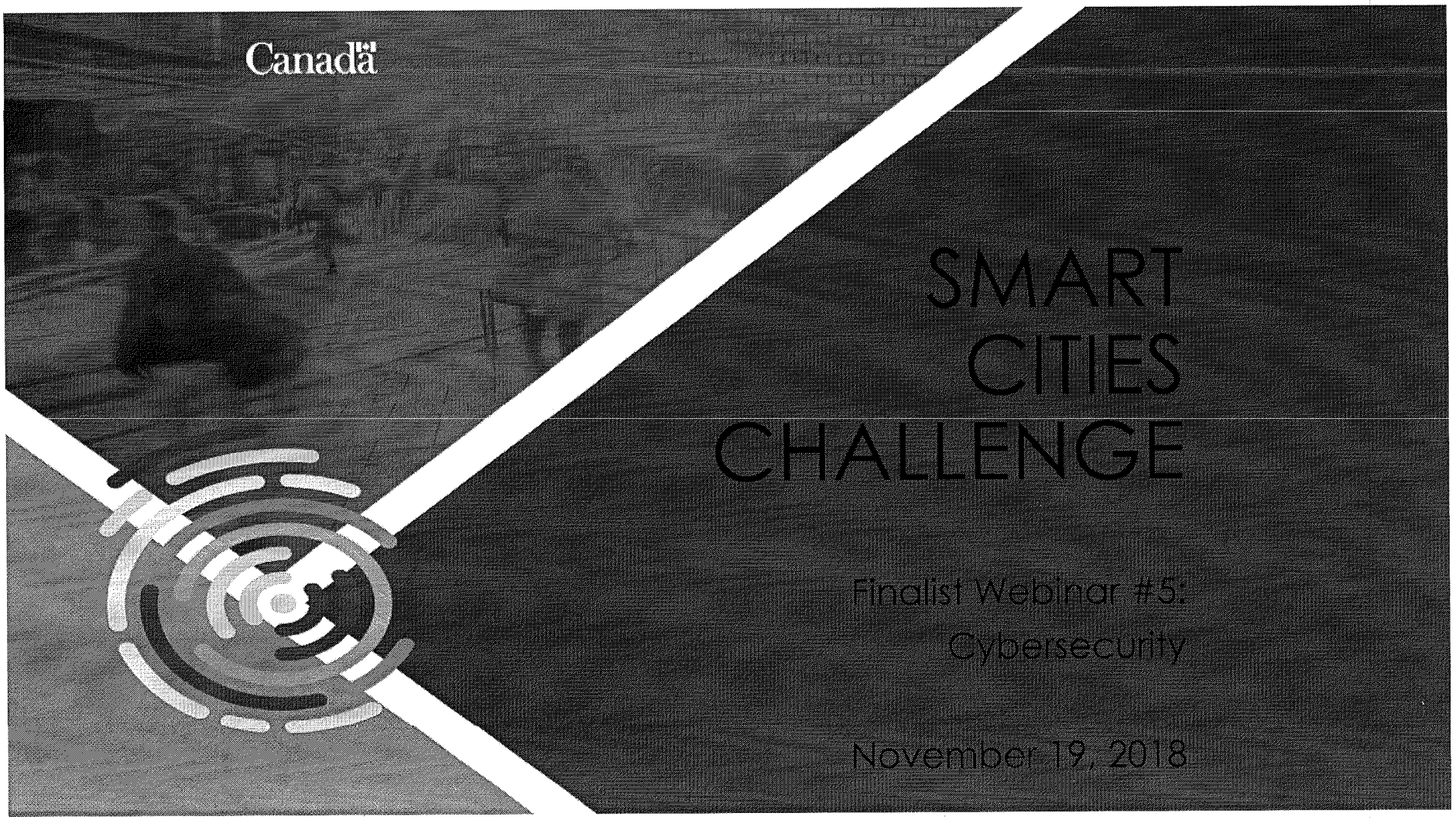
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WRAP-UP

- Follow up questions
- Site visits
- Connect with the Community Support Program:

https://www.infrastructure.gc.ca/cities-villes/support-soutien-eng.html

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AGENDA

- Overview
- Finalist requirements related to cybersecurity
- Presentation from the Canadian Centre for Cyber Security of the Communications Security Establishment
- Q&A
- Communications touch base
- Wrap-up and next steps

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FINALIST REQUIREMENTS - CYBERSECURITY

Finalist Guide requirements:

- Chapter 4: Technology
- Chapter 7: Data and privacy
  - Preliminary Privacy Impact Assessment or Preliminary Rationale Analysis

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Page(s) 35 to 63
are under consultation
Please seen Interim 14 for these pages

****

La/les page(s) 35 à 63
Sont sous consultation
Veuillez consulter l'intérim 14 pour ces pages

Communications touch-base

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WRAP-UP

- Upcoming webinar
  - Outcomes-based Performance Measurement
- Site Visits: Fall 2018 and Winter 2019
- Contact relevant privacy authorities

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ATIA - 21(1)(b)

Knecht, Brigit (INFC)

From: Knecht, Brigit (INFC)
Sent: March 4, 2019 11:56 AM
To: INFC.F Smart Cities Challenge / Défi des villes intelligentes F.INFC
Subject: Fredericton video sneak peek

At the Smart Community Roadshow event, getting a sneak peek of the Fredericton video. 5 big projects, looks great! They make our fingerprint logo spin around! Also, their PPIA is 110 pages long. [redacted]

BK

Sent from my iPhone

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Reviewer:

$5 Million MOHAWK COUNCIL OF AKWESASNE

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
(1/5 or 2/10) Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
(2/5 or 4/10) Some good aspects, some questionable/weak demonstrations that need to be addressed
(3/5 or 6/10) Reasonably good demonstration on most aspects with some weaknesses that need addressing
(4/5 or 8/10) Very good demonstration on virtually all aspects some weaknesses of modest consequence
(5/5 or 10/10) Exemplary demonstration with no weaknesses

Chapter 1: Vision (15 pts. Total)	**Max Points**	
Final proposal is driven by the Challenge Statement and carries through the vision laid out in the application	5 pts.	
Final proposal is transformative, scalable, and replicable within the community and to other communities in Canada	10 pts.	
		0

Reviewer comments:

Reviewer:

$5 Million MOHAWK COUNCIL OF AKWESASNE

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(5/5 or 10/10) Exemplary demonstration with no weaknesses

Chapter 6: Engagement (30 pts. Total)	**Max Points**	
Engagement to date and plans to engage residents and other stakeholders in the implementation phase are detailed, complete, inclusive, meaningful, and well-suited to achieve the outcomes:	10 pts.	
Plan supports the implementation of projects:	5 pts.	
Diversity and inclusion are reflected in project design, and facilitate the implementation of projects:	10 pts.	
Risk strategy is thorough and adequately addresses key risks:	5 pts.	
		0

Reviewer Comments:

Reviewer:		

$5 Million MOHAWK COUNCIL OF AKWESASNE

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(5/5 or 10/10) Exemplary demonstration with no weaknesses

Chapter 9: Implementation phase requirements (10 pts. Total)	**Max Points**	
Plans for meeting relevant municipal, provincial, and federal reporting and legislative requirements are provided and serve as sufficient groundwork for the implementation phase should the finalist be selected as a winner:	5 pts.	
Risk strategy is thorough and adequately addresses key risks:	5 pts.	
		0

Reviewer Comments:

Grand Total	**0**

Reviewer:

$5 Million BIIGTIGONG NISHNAABEG

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Reviewer comments:

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(2/5 or 4/10) Some good aspects, some questionable/weak demonstrations that need to be addressed
(3/5 or 6/10) Reasonably good demonstration on most aspects with some weaknesses that need addressing
(4/5 or 8/10) Very good demonstration on virtually all aspects some weaknesses of modest consequence
(5/5 or 10/10) Exemplary demonstration with no weaknesses

Chapter 9: Implementation phase requirements (10 pts. Total)	**Max Points**	
Plans for meeting relevant municipal, provincial, and federal reporting and legislative requirements are provided and serve as sufficient groundwork for the implementation phase should the finalist be selected as a winner:	5 pts.	
Risk strategy is thorough and adequately addresses key risks:	5 pts.	
		0

Reviewer Comments:

Grand Total	**0**

Reviewer:

$5 Million TOWN OF BRIDGEWATER

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
(1/5 or 2/10) Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
(2/5 or 4/10) Some good aspects, some questionable/weak demonstrations that need to be addressed
(3/5 or 6/10) Reasonably good demonstration on most aspects with some weaknesses that need addressing
(4/5 or 8/10) Very good demonstration on virtually all aspects some weaknesses of modest consequence
(5/5 or 10/10) Exemplary demonstration with no weaknesses

Chapter 1: Vision (15 pts. Total)	**Max Points**	
Final proposal is driven by the Challenge Statement and carries through the vision laid out in the application	5 pts.	
Final proposal is transformative, scalable, and replicable within the community and to other communities in Canada	10 pts.	0
		0

Reviewer Comments:

Reviewer:

$5 Million TOWN OF BRIDGEWATER

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
(1/5 or 2/10) Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
(2/5 or 4/10) Some good aspects, some questionable/weak demonstrations that need to be addressed
(3/5 or 6/10) Reasonably good demonstration on most aspects with some weaknesses that need addressing
(4/5 or 8/10) Very good demonstration on virtually all aspects some weaknesses of modest consequence
(5/5 or 10/10) Exemplary demonstration with no weaknesses

Chapter 6: Engagement (30 pts. Total)	**Max Points**	
Engagement to date and plans to engage residents and other stakeholders in the implementation phase are detailed, complete, inclusive, meaningful, and well-suited to achieve the outcomes:	10 pts.	
Plan supports the implementation of projects:	5 pts.	
Diversity and inclusion are reflected in project design, and facilitate the implementation of projects:	10 pts.	
Risk strategy is thorough and adequately addresses key risks:	5 pts.	
		0

Reviewer Comments:

Reviewer:

$5 Million TOWN OF BRIDGEWATER

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
(1/5 or 2/10) Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
(2/5 or 4/10) Some good aspects, some questionable/weak demonstrations that need to be addressed
(3/5 or 6/10) Reasonably good demonstration on most aspects with some weaknesses that need addressing
(4/5 or 8/10) Very good demonstration on virtually all aspects some weaknesses of modest consequence
(5/5 or 10/10) Exemplary demonstration with no weaknesses

Chapter 9: Implementation phase requirements (10 pts. Total)	**Max Points**	
Plans for meeting relevant municipal, provincial, and federal reporting and legislative requirements are provided and serve as sufficient groundwork for the implementation phase should the finalist be selected as a winner:	5 pts.	
Risk strategy is thorough and adequately addresses key risks:	5 pts.	
		0

Reviewer Comments:

Grand Total	**0**

Reviewer:

$5 Million CREE NATION OF EASTMAIN

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
(1/5 or 2/10) Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
(2/5 or 4/10) Some good aspects, some questionable/weak demonstrations that need to be addressed
(3/5 or 6/10) Reasonably good demonstration on most aspects with some weaknesses that need addressing
(4/5 or 8/10) Very good demonstration on virtually all aspects some weaknesses of modest consequence
(5/5 or 10/10) Exemplary demonstration with no weaknesses

Chapter 1: Vision (15 pts. Total)	**Max Points**	
Final proposal is driven by the Challenge Statement and carries through the vision laid out in the application	5 pts.	
Final proposal is transformative, scalable, and replicable within the community and to other communities in Canada	10 pts.	
		0

Reviewer Comments:

Reviewer:

$5 Million CREE NATION OF EASTMAIN

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
(1/5 or 2/10) Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
(2/5 or 4/10) Some good aspects, some questionable/weak demonstrations that need to be addressed
(3/5 or 6/10) Reasonably good demonstration on most aspects with some weaknesses that need addressing
(4/5 or 8/10) Very good demonstration on virtually all aspects some weaknesses of modest consequence
(5/5 or 10/10) Exemplary demonstration with no weaknesses

Chapter 6: Engagement (30 pts. Total)	**Max Points**	
Engagement to date and plans to engage residents and other stakeholders in the implementation phase are detailed, complete, inclusive, meaningful, and well-suited to achieve the outcomes:	10 pts.	
Plan supports the implementation of projects:	5 pts.	
Diversity and inclusion are reflected in project design, and facilitate the implementation of projects:	10 pts.	
Risk strategy is thorough and adequately addresses key risks:	5 pts.	
		0

Reviewer Comments:

Reviewer:

$5 Million CREE NATION OF EASTMAIN

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
(1/5 or 2/10) Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
(2/5 or 4/10) Some good aspects, some questionable/weak demonstrations that need to be addressed
(3/5 or 6/10) Reasonably good demonstration on most aspects with some weaknesses that need addressing
(4/5 or 8/10) Very good demonstration on virtually all aspects some weaknesses of modest consequence
(5/5 or 10/10) Exemplary demonstration with no weaknesses

Chapter 9: Implementation phase requirements (10 pts. Total)	**Max Points**	
Plans for meeting relevant municipal, provincial, and federal reporting and legislative requirements are provided and serve as sufficient groundwork for the implementation phase should the finalist be selected as a winner:	5 pts.	
Risk strategy is thorough and adequately addresses key risks:	5 pts.	
		0

Reviewer Comments:

Grand Total	**0**

Reviewer:

$5 Million CITY OF YELLOWKNIFE

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
(1/5 or 2/10) Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
(2/5 or 4/10) Some good aspects, some questionable/weak demonstrations that need to be addressed
(3/5 or 6/10) Reasonably good demonstration on most aspects with some weaknesses that need addressing
(4/5 or 8/10) Very good demonstration on virtually all aspects some weaknesses of modest consequence
(5/5 or 10/10) Exemplary demonstration with no weaknesses

Chapter 1: Vision (15 pts. Total)	**Max Points**	
Final proposal is driven by the Challenge Statement and carries through the vision laid out in the application	5 pts.	
Final proposal is transformative, scalable, and replicable within the community and to other communities in Canada	10 pts.	
		0

Reviewer Comments:

Reviewer:

$5 Million CITY OF YELLOWKNIFE

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
(1/5 or 2/10) Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
(2/5 or 4/10) Some good aspects, some questionable/weak demonstrations that need to be addressed
(3/5 or 6/10) Reasonably good demonstration on most aspects with some weaknesses that need addressing
(4/5 or 8/10) Very good demonstration on virtually all aspects some weaknesses of modest consequence
(5/5 or 10/10) Exemplary demonstration with no weaknesses

Chapter 6: Engagement (30 pts. Total)	**Max Points**	
Engagement to date and plans to engage residents and other stakeholders in the implementation phase are detailed, complete, inclusive, meaningful, and well-suited to achieve the outcomes:	10 pts.	
Plan supports the implementation of projects:	5 pts.	
Diversity and inclusion are reflected in project design, and facilitate the implementation of projects:	10 pts.	
Risk strategy is thorough and adequately addresses key risks:	5 pts.	
		0

Reviewer Comments:

Reviewer:

$5 Million CITY OF YELLOWKNIFE

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
(1/5 or 2/10) Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
(2/5 or 4/10) Some good aspects, some questionable/weak demonstrations that need to be addressed
(3/5 or 6/10) Reasonably good demonstration on most aspects with some weaknesses that need addressing
(4/5 or 8/10) Very good demonstration on virtually all aspects some weaknesses of modest consequence
(5/5 or 10/10) Exemplary demonstration with no weaknesses

Chapter 9: Implementation phase requirements (10 pts. Total)	**Max Points**	
Plans for meeting relevant municipal, provincial, and federal reporting and legislative requirements are provided and serve as sufficient groundwork for the implementation phase should the finalist be selected as a winner:	5 pts.	
Risk strategy is thorough and adequately addresses key risks:	5 pts.	
		0

Reviewer Comments:

Grand Total	**0**

Reviewer:

$10 Million CITY OF AIRDRIE AND AREA

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
(1/5 or 2/10) Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
(2/5 or 4/10) Some good aspects, some questionable/weak demonstrations that need to be addressed
(3/5 or 6/10) Reasonably good demonstration on most aspects with some weaknesses that need addressing
(4/5 or 8/10) Very good demonstration on virtually all aspects some weaknesses of modest consequence
(5/5 or 10/10) Exemplary demonstration with no weaknesses

Chapter 1: Vision (15 pts. Total)	**Max Points**	
Final proposal is driven by the Challenge Statement and carries through the vision laid out in the application	5 pts.	
Final proposal is transformative, scalable, and replicable within the community and to other communities in Canada	10 pts.	
		0

Reviewer Comments:

Reviewer:

$10 Million CITY OF AIRDRIE AND AREA

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
(1/5 or 2/10) Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
(2/5 or 4/10) Some good aspects, some questionable/weak demonstrations that need to be addressed
(3/5 or 6/10) Reasonably good demonstration on most aspects with some weaknesses that need addressing
(4/5 or 8/10) Very good demonstration on virtually all aspects some weaknesses of modest consequence
(5/5 or 10/10) Exemplary demonstration with no weaknesses

Chapter 6: Engagement (30 pts. Total)	**Max Points**	
Engagement to date and plans to engage residents and other stakeholders in the implementation phase are detailed, complete, inclusive, meaningful, and well-suited to achieve the outcomes:	10 pts.	
Plan supports the implementation of projects:	5 pts.	
Diversity and inclusion are reflected in project design, and facilitate the implementation of	10 pts.	
Risk strategy is thorough and adequately addresses key risks:	5 pts.	
		0

Reviewer Comments:

Reviewer:

$10 Million CITY OF AIRDRIE AND AREA

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
(1/5 or 2/10) Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
(2/5 or 4/10) Some good aspects, some questionable/weak demonstrations that need to be addressed
(3/5 or 6/10) Reasonably good demonstration on most aspects with some weaknesses that need addressing
(4/5 or 8/10) Very good demonstration on virtually all aspects some weaknesses of modest consequence
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Chapter 9: Implementation phase requirements (10 pts. Total)	**Max Points**	
Plans for meeting relevant municipal, provincial, and federal reporting and legislative requirements are provided and serve as sufficient groundwork for the implementation phase should the finalist be selected as a winner:	5 pts.	
Risk strategy is thorough and adequately addresses key risks:	5 pts.	
		0

Reviewer Comments:

Grand Total	**0**

Reviewer:

$10 Million CITY OF CÔTE SAINT-LUC

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
(1/5 or 2/10) Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
(2/5 or 4/10) Some good aspects, some questionable/weak demonstrations that need to be addressed
(3/5 or 6/10) Reasonably good demonstration on most aspects with some weaknesses that need addressing
(4/5 or 8/10) Very good demonstration on virtually all aspects some weaknesses of modest consequence
(5/5 or 10/10) Exemplary demonstration with no weaknesses

Chapter 1: Vision (15 pts. Total)	**Max Points**	
Final proposal is driven by the Challenge Statement and carries through the vision laid out in the application	5 pts.	
Final proposal is transformative, scalable, and replicable within the community and to other communities in Canada	10 pts.	
		0

Reviewer Comments:

Reviewer:

$10 Million CITY OF CÔTE SAINT-LUC

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
(1/5 or 2/10) Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
(2/5 or 4/10) Some good aspects, some questionable/weak demonstrations that need to be addressed
(3/5 or 6/10) Reasonably good demonstration on most aspects with some weaknesses that need addressing
(4/5 or 8/10) Very good demonstration on virtually all aspects some weaknesses of modest consequence
(5/5 or 10/10) Exemplary demonstration with no weaknesses

Chapter 6: Engagement (30 pts. Total)	**Max Points**	
Engagement to date and plans to engage residents and other stakeholders in the implementation phase are detailed, complete, inclusive, meaningful, and well-suited to achieve the outcomes:	10 pts.	
Plan supports the implementation of projects:	5 pts.	
Diversity and inclusion are reflected in project design, and facilitate the implementation of	10 pts.	
Risk strategy is thorough and adequately addresses key risks:	5 pts.	
		0

Reviewer Comments:

Reviewer:

$10 Million CITY OF CÔTE SAINT-LUC

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
(1/5 or 2/10) Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
(2/5 or 4/10) Some good aspects, some questionable/weak demonstrations that need to be addressed
(3/5 or 6/10) Reasonably good demonstration on most aspects with some weaknesses that need addressing
(4/5 or 8/10) Very good demonstration on virtually all aspects some weaknesses of modest consequence
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Chapter 9: Implementation phase requirements (10 pts. Total)	**Max Points**	
Plans for meeting relevant municipal, provincial, and federal reporting and legislative requirements are provided and serve as sufficient groundwork for the implementation phase should the finalist be selected as a winner:	5 pts.	
Risk strategy is thorough and adequately addresses key risks:	5 pts.	
		0

Reviewer Comments:

Grand Total	**0**

Reviewer:

$10 Million ST. MARY'S FIRST NATION AND CITY OF FREDERICTON

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
(1/5 or 2/10) Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
(2/5 or 4/10) Some good aspects, some questionable/weak demonstrations that need to be addressed
(3/5 or 6/10) Reasonably good demonstration on most aspects with some weaknesses that need addressing
(4/5 or 8/10) Very good demonstration on virtually all aspects some weaknesses of modest consequence
(5/5 or 10/10) Exemplary demonstration with no weaknesses

Chapter 1: Vision (15 pts. Total)	**Max Points**	
Final proposal is driven by the Challenge Statement and carries through the vision laid out in the application	5 pts.	
Final proposal is transformative, scalable, and replicable within the community and to other communities in Canada	10 pts.	
		0

Reviewer comments:

Reviewer:

$10 Million ST. MARY'S FIRST NATION AND CITY OF FREDERICTON

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
(1/5 or 2/10) Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
(2/5 or 4/10) Some good aspects, some questionable/weak demonstrations that need to be addressed
(3/5 or 6/10) Reasonably good demonstration on most aspects with some weaknesses that need addressing
(4/5 or 8/10) Very good demonstration on virtually all aspects some weaknesses of modest consequence
(5/5 or 10/10) Exemplary demonstration with no weaknesses

Chapter 6: Engagement (30 pts. Total)	**Max Points**	
Engagement to date and plans to engage residents and other stakeholders in the implementation phase are detailed, complete, inclusive, meaningful, and well-suited to achieve the outcomes:	10 pts.	
Plan supports the implementation of projects:	5 pts.	
Diversity and inclusion are reflected in project design, and facilitate the implementation of projects:	10 pts.	
Risk strategy is thorough and adequately addresses key risks:	5 pts.	
		0

Reviewer Comments:

Reviewer:		

$10 Million ST. MARY'S FIRST NATION AND CITY OF FREDERICTON

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
(1/5 or 2/10) Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
(2/5 or 4/10) Some good aspects, some questionable/weak demonstrations that need to be addressed
(3/5 or 6/10) Reasonably good demonstration on most aspects with some weaknesses that need addressing
(4/5 or 8/10) Very good demonstration on virtually all aspects some weaknesses of modest consequence
(5/5 or 10/10) Exemplary demonstration with no weaknesses

Chapter 9: Implementation phase requirements (10 pts. Tot	**Max Points**	
Plans for meeting relevant municipal, provincial, and federal reporting and legislative requirements are provided and serve as sufficient groundwork for the implementation phase should the finalist be selected as a winner:	5 pts.	
Risk strategy is thorough and adequately addresses key risks:	5 pts.	
		0

Reviewer comments:

Grand Total	**0**

Reviewer:

$10 Million CITY OF GUELPH AND WELLINGTON COUNTY

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
(1/5 or 2/10) Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
(2/5 or 4/10) Some good aspects, some questionable/weak demonstrations that need to be addressed
(3/5 or 6/10) Reasonably good demonstration on most aspects with some weaknesses that need addressing
(4/5 or 8/10) Very good demonstration on virtually all aspects some weaknesses of modest consequence
(5/5 or 10/10) Exemplary demonstration with no weaknesses

Chapter 1: Vision (15 pts. Total)	**Max Points**	
Final proposal is driven by the Challenge Statement and carries through the vision laid out in the application	5 pts.	
Final proposal is transformative, scalable, and replicable within the community and to other communities in Canada	10 pts.	
		0

Reviewer comments:

Reviewer:

$10 Million CITY OF GUELPH AND WELLINGTON COUNTY

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
(1/5 or 2/10) Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
(2/5 or 4/10) Some good aspects, some questionable/weak demonstrations that need to be addressed
(3/5 or 6/10) Reasonably good demonstration on most aspects with some weaknesses that need addressing
(4/5 or 8/10) Very good demonstration on virtually all aspects some weaknesses of modest consequence
(5/5 or 10/10) Exemplary demonstration with no weaknesses

Chapter 6: Engagement (30 pts. Total)	**Max Points**	
Engagement to date and plans to engage residents and other stakeholders in the implementation phase are detailed, complete, inclusive, meaningful, and well-suited to achieve the outcomes:	10 pts.	
Plan supports the implementation of projects:	5 pts.	
Diversity and inclusion are reflected in project design, and facilitate the implementation of projects:	10 pts.	
Risk strategy is thorough and adequately addresses key risks:	5 pts.	
		0

Reviewer comments:

Reviewer:

$10 Million CITY OF GUELPH AND WELLINGTON COUNTY

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
(1/5 or 2/10) Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
(2/5 or 4/10) Some good aspects, some questionable/weak demonstrations that need to be addressed
(3/5 or 6/10) Reasonably good demonstration on most aspects with some weaknesses that need addressing
(4/5 or 8/10) Very good demonstration on virtually all aspects some weaknesses of modest consequence
(5/5 or 10/10) Exemplary demonstration with no weaknesses

Chapter 9: Implementation phase requirements (10 pts. Total)	**Max Points**	
Plans for meeting relevant municipal, provincial, and federal reporting and legislative requirements are provided and serve as sufficient groundwork for the implementation phase should the finalist be selected as a winner:	5 pts.	
Risk strategy is thorough and adequately addresses key risks:	5 pts.	
		0

Reviewer comments:

Grand Total	**0**

Reviewer:

$10 Million NUNAVUT COMMUNITIES

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
(1/5 or 2/10) Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
(2/5 or 4/10) Some good aspects, some questionable/weak demonstrations that need to be addressed
(3/5 or 6/10) Reasonably good demonstration on most aspects with some weaknesses that need addressing
(4/5 or 8/10) Very good demonstration on virtually all aspects some weaknesses of modest consequence
(5/5 or 10/10) Exemplary demonstration with no weaknesses

Chapter 1: Vision (15 pts. Total)	**Max Points**	
Final proposal is driven by the Challenge Statement and carries through the vision laid out in the application	5 pts.	
Final proposal is transformative, scalable, and replicable within the community and to other communities in Canada	10 pts.	
		0

Reviewer comments:

Reviewer:

$10 Million NUNAVUT COMMUNITIES

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
(1/5 or 2/10) Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
(2/5 or 4/10) Some good aspects, some questionable/weak demonstrations that need to be addressed
(3/5 or 6/10) Reasonably good demonstration on most aspects with some weaknesses that need addressing
(4/5 or 8/10) Very good demonstration on virtually all aspects some weaknesses of modest consequence
(5/5 or 10/10) Exemplary demonstration with no weaknesses

Chapter 6: Engagement (30 pts. Total)	**Max Points**	
Engagement to date and plans to engage residents and other stakeholders in the implementation phase are detailed, complete, inclusive, meaningful, and well-suited to achieve the outcomes:	10 pts.	
Plan supports the implementation of projects:	5 pts.	
Diversity and inclusion are reflected in project design, and facilitate the implementation of projects:	10 pts.	
Risk strategy is thorough and adequately addresses key risks:	5 pts.	
		0

Reviewer comments:

Reviewer:

$10 Million NUNAVUT COMMUNITIES

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
(1/5 or 2/10) Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
(2/5 or 4/10) Some good aspects, some questionable/weak demonstrations that need to be addressed
(3/5 or 6/10) Reasonably good demonstration on most aspects with some weaknesses that need addressing
(4/5 or 8/10) Very good demonstration on virtually all aspects some weaknesses of modest consequence
(5/5 or 10/10) Exemplary demonstration with no weaknesses

Chapter 9: Implementation phase requirements (10 pts. Total)	**Max Points**	
Plans for meeting relevant municipal, provincial, and federal reporting and legislative requirements are provided and serve as sufficient groundwork for the implementation phase should the finalist be selected as a winner:	5 pts.	
Risk strategy is thorough and adequately addresses key risks:	5 pts.	
		0

Reviewer comments:

Grand Total	**0**

Reviewer:

$10 Million PARKLAND COUNTY (GROUP)

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
(1/5 or 2/10) Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
(2/5 or 4/10) Some good aspects, some questionable/weak demonstrations that need to be addressed
(3/5 or 6/10) Reasonably good demonstration on most aspects with some weaknesses that need addressing
(4/5 or 8/10) Very good demonstration on virtually all aspects some weaknesses of modest consequence
(5/5 or 10/10) Exemplary demonstration with no weaknesses

Chapter 1: Vision (15 pts. Total)	**Max Points**	
Final proposal is driven by the Challenge Statement and carries through the vision laid out in the application	5 pts.	
Final proposal is transformative, scalable, and replicable within the community and to other communities in Canada	10 pts.	
		0

Reviewer comments:

Reviewer:

$10 Million PARKLAND COUNTY (GROUP)

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
(1/5 or 2/10) Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
(2/5 or 4/10) Some good aspects, some questionable/weak demonstrations that need to be addressed
(3/5 or 6/10) Reasonably good demonstration on most aspects with some weaknesses that need addressing
(4/5 or 8/10) Very good demonstration on virtually all aspects some weaknesses of modest consequence
(5/5 or 10/10) Exemplary demonstration with no weaknesses

Chapter 6: Engagement (30 pts. Total)	**Max Points**	
Engagement to date and plans to engage residents and other stakeholders in the implementation phase are detailed, complete, inclusive, meaningful, and well-suited to achieve the outcomes:	10 pts.	
Plan supports the implementation of projects:	5 pts.	
Diversity and inclusion are reflected in project design, and facilitate the implementation of projects:	10 pts.	
Risk strategy is thorough and adequately addresses key risks:	5 pts.	
		0

Reviewer comments:

Reviewer:

$10 Million PARKLAND COUNTY (GROUP)

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
(1/5 or 2/10) Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
(2/5 or 4/10) Some good aspects, some questionable/weak demonstrations that need to be addressed
(3/5 or 6/10) Reasonably good demonstration on most aspects with some weaknesses that need addressing
(4/5 or 8/10) Very good demonstration on virtually all aspects some weaknesses of modest consequence
(5/5 or 10/10) Exemplary demonstration with no weaknesses

Chapter 9: Implementation phase requirements (10 pts. Total)	**Max Points**	
Plans for meeting relevant municipal, provincial, and federal reporting and legislative requirements are provided and serve as sufficient groundwork for the implementation phase should the finalist be selected as a winner:	5 pts.	
Risk strategy is thorough and adequately addresses key risks:	5 pts.	
		0

Reviewer comments:

Grand Total	**0**

Reviewer:

$10 Million CITY OF RICHMOND

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
(1/5 or 2/10) Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
(2/5 or 4/10) Some good aspects, some questionable/weak demonstrations that need to be addressed
(3/5 or 6/10) Reasonably good demonstration on most aspects with some weaknesses that need addressing
(4/5 or 8/10) Very good demonstration on virtually all aspects some weaknesses of modest consequence
(5/5 or 10/10) Exemplary demonstration with no weaknesses

Chapter 1: Vision (15 pts. Total)	**Max Points**	
Final proposal is driven by the Challenge Statement and carries through the vision laid out in the application	5 pts.	
Final proposal is transformative, scalable, and replicable within the community and to other communities in Canada	10 pts.	
		0

Reviewer comments:

Reviewer:		

$10 Million CITY OF RICHMOND

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
(1/5 or 2/10) Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
(2/5 or 4/10) Some good aspects, some questionable/weak demonstrations that need to be addressed
(3/5 or 6/10) Reasonably good demonstration on most aspects with some weaknesses that need addressing
(4/5 or 8/10) Very good demonstration on virtually all aspects some weaknesses of modest consequence
(5/5 or 10/10) Exemplary demonstration with no weaknesses

Chapter 6: Engagement (30 pts. Total)	**Max Points**	
Engagement to date and plans to engage residents and other stakeholders in the implementation phase are detailed, complete, inclusive, meaningful, and well-suited to achieve the outcomes:	10 pts.	
Plan supports the implementation of projects:	5 pts.	
Diversity and inclusion are reflected in project design, and facilitate the implementation of projects:	10 pts.	
Risk strategy is thorough and adequately addresses key risks:	5 pts.	
		0

Reviewer comments:

Reviewer:		

$10 Million CITY OF RICHMOND

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
(1/5 or 2/10) Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
(2/5 or 4/10) Some good aspects, some questionable/weak demonstrations that need to be addressed
(3/5 or 6/10) Reasonably good demonstration on most aspects with some weaknesses that need addressing
(4/5 or 8/10) Very good demonstration on virtually all aspects some weaknesses of modest consequence
(5/5 or 10/10) Exemplary demonstration with no weaknesses

Chapter 9: Implementation phase requirements (10 pts. Total)	**Max Points**	
Plans for meeting relevant municipal, provincial, and federal reporting and legislative requirements are provided and serve as sufficient groundwork for the implementation phase should the finalist be selected as a winner:	5 pts.	
Risk strategy is thorough and adequately addresses key risks:	5 pts.	
		0

Reviewer comments:

Grand Total	**0**

Reviewer:

$10 Million CITY OF SASKATOON

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
(1/5 or 2/10) Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
(2/5 or 4/10) Some good aspects, some questionable/weak demonstrations that need to be addressed
(3/5 or 6/10) Reasonably good demonstration on most aspects with some weaknesses that need addressing
(4/5 or 8/10) Very good demonstration on virtually all aspects some weaknesses of modest consequence
(5/5 or 10/10) Exemplary demonstration with no weaknesses

Chapter 1: Vision (15 pts. Total)	**Max Points**	
Final proposal is driven by the Challenge Statement and carries through the vision laid out in the application	5 pts.	
Final proposal is transformative, scalable, and replicable within the community and to other communities in Canada	10 pts.	
		0

Reviewer comments:

Reviewer:

$10 Million CITY OF SASKATOON

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
(1/5 or 2/10) Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
(2/5 or 4/10) Some good aspects, some questionable/weak demonstrations that need to be addressed
(3/5 or 6/10) Reasonably good demonstration on most aspects with some weaknesses that need addressing
(4/5 or 8/10) Very good demonstration on virtually all aspects some weaknesses of modest consequence
(5/5 or 10/10) Exemplary demonstration with no weaknesses

Chapter 6: Engagement (30 pts. Total)	**Max Points**	
Engagement to date and plans to engage residents and other stakeholders in the implementation phase are detailed, complete, inclusive, meaningful, and well-suited to achieve the outcomes:	10 pts.	
Plan supports the implementation of projects:	5 pts.	
Diversity and inclusion are reflected in project design, and facilitate the implementation of projects:	10 pts.	
Risk strategy is thorough and adequately addresses key risks:	5 pts.	
		0

Reviewer comments:

Reviewer:

$10 Million CITY OF SASKATOON

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
(1/5 or 2/10) Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
(2/5 or 4/10) Some good aspects, some questionable/weak demonstrations that need to be addressed
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(4/5 or 8/10) Very good demonstration on virtually all aspects some weaknesses of modest consequence
(5/5 or 10/10) Exemplary demonstration with no weaknesses

Chapter 9: Implementation phase requirements (10 pts. Total)	**Max Points**	
Plans for meeting relevant municipal, provincial, and federal reporting and legislative requirements are provided and serve as sufficient groundwork for the implementation phase should the finalist be selected as a winner:	5 pts.	
Risk strategy is thorough and adequately addresses key risks:	5 pts.	
		0

Reviewer comments:

Grand Total	**0**

Reviewer:		

$10 Million TOWN OF THE PAS, OPASKWAYAK CREE NATION, R.M. OF KELSEY

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
(1/5 or 2/10) Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
(2/5 or 4/10) Some good aspects, some questionable/weak demonstrations that need to be addressed
(3/5 or 6/10) Reasonably good demonstration on most aspects with some weaknesses that need addressing
(4/5 or 8/10) Very good demonstration on virtually all aspects some weaknesses of modest consequence
(5/5 or 10/10) Exemplary demonstration with no weaknesses

Chapter 1: Vision (15 pts. Total)	**Max Points**	
Final proposal is driven by the Challenge Statement and carries through the vision laid out in the application	5 pts.	
Final proposal is transformative, scalable, and replicable within the community and to other communities in Canada	10 pts.	
		0

Reviewer comments:

Reviewer:

$10 Million TOWN OF THE PAS, OPASKWAYAK CREE NATION, R.M. OF KELSEY

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
(1/5 or 2/10) Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
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(5/5 or 10/10) Exemplary demonstration with no weaknesses

Chapter 6: Engagement (30 pts. Total)	**Max Points**	
Engagement to date and plans to engage residents and other stakeholders in the implementation phase are detailed, complete, inclusive, meaningful, and well-suited to achieve the outcomes:	10 pts.	
Plan supports the implementation of projects:	5 pts.	
Diversity and inclusion are reflected in project design, and facilitate the implementation of projects:	10 pts.	
Risk strategy is thorough and adequately addresses key risks:	5 pts.	
		0

Reviewer comments:

Reviewer:

$10 Million TOWN OF THE PAS, OPASKWAYAK CREE NATION, R.M. OF KELSEY

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
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Chapter 9: Implementation phase requirements (10 pts. Total)	**Max Points**	
Plans for meeting relevant municipal, provincial, and federal reporting and legislative requirements are provided and serve as sufficient groundwork for the implementation phase should the finalist be selected as a winner:	5 pts.	
Risk strategy is thorough and adequately addresses key risks:	5 pts.	
		0

Reviewer comments:

Grand Total	**0**

Reviewer:

$10 Million GREATER VICTORIA

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
(1/5 or 2/10) Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
(2/5 or 4/10) Some good aspects, some questionable/weak demonstrations that need to be addressed
(3/5 or 6/10) Reasonably good demonstration on most aspects with some weaknesses that need addressing
(4/5 or 8/10) Very good demonstration on virtually all aspects some weaknesses of modest consequence
(5/5 or 10/10) Exemplary demonstration with no weaknesses

Chapter 1: Vision (15 pts. Total)	**Max Points**	
Final proposal is driven by the Challenge Statement and carries through the vision laid out in the application	5 pts.	
Final proposal is transformative, scalable, and replicable within the community and to other communities in Canada	10 pts.	
		0

Reviewer comments:

Reviewer:

$10 Million GREATER VICTORIA

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
(1/5 or 2/10) Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
(2/5 or 4/10) Some good aspects, some questionable/weak demonstrations that need to be addressed
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Chapter 6: Engagement (30 pts. Total)	**Max Points**	
Engagement to date and plans to engage residents and other stakeholders in the implementation phase are detailed, complete, inclusive, meaningful, and well-suited to achieve the outcomes:	10 pts.	
Plan supports the implementation of projects:	5 pts.	
Diversity and inclusion are reflected in project design, and facilitate the implementation of projects:	10 pts.	
Risk strategy is thorough and adequately addresses key risks:	5 pts.	
		0

Reviewer comments:

Reviewer:		

$10 Million GREATER VICTORIA

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
(1/5 or 2/10) Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
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Plans for meeting relevant municipal, provincial, and federal reporting and legislative requirements are provided and serve as sufficient groundwork for the implementation phase should the finalist be selected as a winner:	5 pts.	
Risk strategy is thorough and adequately addresses key risks:	5 pts.	
		0

Reviewer comments:

Grand Total	**0**

Reviewer:

$50 Million CITY OF EDMONTON

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
(1/5 or 2/10) Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
(2/5 or 4/10) Some good aspects, some questionable/weak demonstrations that need to be addressed
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(4/5 or 8/10) Very good demonstration on virtually all aspects some weaknesses of modest consequence
(5/5 or 10/10) Exemplary demonstration with no weaknesses

Chapter 1: Vision (15 pts. Total)	**Max Points**	
Final proposal is driven by the Challenge Statement and carries through the vision laid out in the application	5 pts.	
Final proposal is transformative, scalable, and replicable within the community and to other communities in Canada	10 pts.	
		0

Reviewer comments:

Reviewer:

$50 Million CITY OF EDMONTON

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
(1/5 or 2/10) Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
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(4/5 or 8/10) Very good demonstration on virtually all aspects some weaknesses of modest consequence
(5/5 or 10/10) Exemplary demonstration with no weaknesses

Chapter 6: Engagement (30 pts. Total)	**Max Points**	
Engagement to date and plans to engage residents and other stakeholders in the implementation phase are detailed, complete, inclusive, meaningful, and well-suited to achieve the outcomes:	10 pts.	
Plan supports the implementation of projects:	5 pts.	
Diversity and inclusion are reflected in project design, and facilitate the implementation of projects:	10 pts.	
Risk strategy is thorough and adequately addresses key risks:	5 pts.	
		0

Reviewer comments:

Reviewer:		
$50 Million CITY OF EDMONTON		
Legend (based on criteria weight of 5 or 10 points) **(0/5 or 0/10)** No demonstration **(1/5 or 2/10)** Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations **(2/5 or 4/10)** Some good aspects, some questionable/weak demonstrations that need to be addressed **(3/5 or 6/10)** Reasonably good demonstration on most aspects with some weaknesses that need addressing **(4/5 or 8/10)** Very good demonstration on virtually all aspects some weaknesses of modest consequence **(5/5 or 10/10)** Exemplary demonstration with no weaknesses		
Chapter 9: Implementation phase requirements (10 pts. Total)	**Max Points**	
Plans for meeting relevant municipal, provincial, and federal reporting and legislative requirements are provided and serve as sufficient groundwork for the implementation phase should the finalist be selected as a winner:	5 pts.	
Risk strategy is thorough and adequately addresses key risks:	5 pts.	
		0
Reviewer comments:		
	Grand Total	**0**

Reviewer:

$50 Million CITY OF MONTRÉAL

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
(1/5 or 2/10) Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
(2/5 or 4/10) Some good aspects, some questionable/weak demonstrations that need to be addressed
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Chapter 1: Vision (15 pts. Total)	**Max Points**	
Final proposal is driven by the Challenge Statement and carries through the vision laid out in the application	5 pts.	
Final proposal is transformative, scalable, and replicable within the community and to other communities in Canada	10 pts.	
		0

Reviewer comments:

Reviewer:

$50 Million CITY OF MONTRÉAL

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(0/5 or 0/10) No demonstration
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Plan supports the implementation of projects:	5 pts.	
Diversity and inclusion are reflected in project design, and facilitate the implementation of projects:	10 pts.	
Risk strategy is thorough and adequately addresses key risks:	5 pts.	
		0

Reviewer comments:

Reviewer:

$50 Million CITY OF MONTRÉAL

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
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Chapter 9: Implementation phase requirements (10 pts. Total)	**Max Points**	
Plans for meeting relevant municipal, provincial, and federal reporting and legislative requirements are provided and serve as sufficient groundwork for the implementation phase should the finalist be selected as a winner:	5 pts.	
Risk strategy is thorough and adequately addresses key risks:	5 pts.	
		0

Reviewer comments:

Grand Total	**0**

Reviewer:

$50 Million QUEBEC CITY

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
(1/5 or 2/10) Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
(2/5 or 4/10) Some good aspects, some questionable/weak demonstrations that need to be addressed
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(5/5 or 10/10) Exemplary demonstration with no weaknesses

Chapter 1: Vision (15 pts. Total)	**Max Points**	
Final proposal is driven by the Challenge Statement and carries through the vision laid out in the application	5 pts.	
Final proposal is transformative, scalable, and replicable within the community and to other communities in Canada	10 pts.	
		0

Reviewer comments:

Reviewer:

$50 Million QUEBEC CITY

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
(1/5 or 2/10) Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
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Chapter 6: Engagement (30 pts. Total)	**Max Points**	
Engagement to date and plans to engage residents and other stakeholders in the implementation phase are detailed, complete, inclusive, meaningful, and well-suited to achieve the outcomes:	10 pts.	
Plan supports the implementation of projects:	5 pts.	
Diversity and inclusion are reflected in project design, and facilitate the implementation of projects:	10 pts.	
Risk strategy is thorough and adequately addresses key risks:	5 pts.	
		0

Reviewer comments:

Reviewer:

$50 Million QUEBEC CITY

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
(1/5 or 2/10) Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
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Chapter 9: Implementation phase requirements (10 pts. Total)	**Max Points**	
Plans for meeting relevant municipal, provincial, and federal reporting and legislative requirements are provided and serve as sufficient groundwork for the implementation phase should the finalist be selected as a winner:	5 pts.	
Risk strategy is thorough and adequately addresses key risks:	5 pts.	
		0

Reviewer comments:

Grand Total	**0**

Reviewer:

$50 Million CITY OF VANCOUVER AND CITY OF SURREY

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
(1/5 or 2/10) Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
(2/5 or 4/10) Some good aspects, some questionable/weak demonstrations that need to be addressed
(3/5 or 6/10) Reasonably good demonstration on most aspects with some weaknesses that need addressing
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(5/5 or 10/10) Exemplary demonstration with no weaknesses

Chapter 1: Vision (15 pts. Total)	**Max Points**	
Final proposal is driven by the Challenge Statement and carries through the vision laid out in the application	5 pts.	
Final proposal is transformative, scalable, and replicable within the community and to other communities in Canada	10 pts.	
		0

Reviewer comments:

Reviewer:

$50 Million CITY OF VANCOUVER AND CITY OF SURREY

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
(1/5 or 2/10) Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
(2/5 or 4/10) Some good aspects, some questionable/weak demonstrations that need to be addressed
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Chapter 6: Engagement (30 pts. Total)	**Max Points**	
Engagement to date and plans to engage residents and other stakeholders in the implementation phase are detailed, complete, inclusive, meaningful, and well-suited to achieve the outcomes:	10 pts.	
Plan supports the implementation of projects:	5 pts.	
Diversity and inclusion are reflected in project design, and facilitate the implementation of projects:	10 pts.	
Risk strategy is thorough and adequately addresses key risks:	5 pts.	
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Reviewer comments:

Reviewer:		

$50 Million CITY OF VANCOUVER AND CITY OF SURREY

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
(1/5 or 2/10) Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
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(5/5 or 10/10) Exemplary demonstration with no weaknesses

Chapter 9: Implementation phase requirements (10 pts. Total)	**Max Points**	
Plans for meeting relevant municipal, provincial, and federal reporting and legislative requirements are provided and serve as sufficient groundwork for the implementation phase should the finalist be selected as a winner:	5 pts.	
Risk strategy is thorough and adequately addresses key risks:	5 pts.	
		0

Reviewer comments:

Grand Total	**0**

Reviewer:

$50 Million WATERLOO REGION

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
(1/5 or 2/10) Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
(2/5 or 4/10) Some good aspects, some questionable/weak demonstrations that need to be addressed
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Chapter 1: Vision (15 pts. Total)	**Max Points**	
Final proposal is driven by the Challenge Statement and carries through the vision laid out in the application	5 pts.	
Final proposal is transformative, scalable, and replicable within the community and to other communities in Canada	10 pts.	
		0

Reviewer comments:

Reviewer:		

$50 Million WATERLOO REGION

Legend (based on criteria weight of 5 or 10 points)
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Chapter 6: Engagement (30 pts. Total)	**Max Points**	
Engagement to date and plans to engage residents and other stakeholders in the implementation phase are detailed, complete, inclusive, meaningful, and well-suited to achieve the outcomes:	10 pts.	
Plan supports the implementation of projects:	5 pts.	
Diversity and inclusion are reflected in project design, and facilitate the implementation of projects:	10 pts.	
Risk strategy is thorough and adequately addresses key risks:	5 pts.	
		0

Reviewer comments:

Reviewer:		
$50 Million WATERLOO REGION		
Legend (based on criteria weight of 5 or 10 points) **(0/5 or 0/10)** No demonstration **(1/5 or 2/10)** Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations **(2/5 or 4/10)** Some good aspects, some questionable/weak demonstrations that need to be addressed **(3/5 or 6/10)** Reasonably good demonstration on most aspects with some weaknesses that need addressing **(4/5 or 8/10)** Very good demonstration on virtually all aspects some weaknesses of modest consequence **(5/5 or 10/10)** Exemplary demonstration with no weaknesses		
Chapter 9: Implementation phase requirements (10 pts. Total)	**Max Points**	
Plans for meeting relevant municipal, provincial, and federal reporting and legislative requirements are provided and serve as sufficient groundwork for the implementation phase should the finalist be selected as a winner:	5 pts.	
Risk strategy is thorough and adequately addresses key risks:	5 pts.	
		0
Reviewer comments:		
	Grand Total	**0**

Instructions

Dear Smart Cities Challenge Jury member,
You have been tasked with evaluating the 20 Finalist proposals of the Smart Cities Challenge Competition 1, with a priority assignement to 5 proposals.

This Excel tool is meant to assist you in documenting your assessments.

If you have any questions or issues regarding the tool, please contact Kathleen Bouchard at kathleen.bouchard@canada.ca or at (613) 790-1838.

Using the Evaluation Grid

The colored tabs in this workbook contain an Evaluation Sheet for each Finalists. You can access them by scrolling left or right at the bottom of the workbook, or by selecting the name of the Finalist in the Table of Contents.

The chapters, criteria and weight of each are provided in each sheet.
When evaluating a criteria, select the cell under the "Jury Score" column and a drop-down button should appear to the right. Select the score that you believe is appropriate.
A legend of the "Jury Score" is available at the top of each sheet for your reference.

Thank you for your participation!

Processed under the provisions of the Access to Information Act /Révisé en vertu de la Loi sur l'accés à l'information

ATIA - 19(1)

ATIA - 21(1)(b)

Table of Contents		
Prize Category	**Community Name**	**Jury Members**
$5M	Mohawk Council of Akwesasne	[redacted]
$5M	Biigtigong Nishnaabeg	
$5M	Town of Bridgewater	
$5M	Cree Nation of Eastmain	
$5M	City of Yellowknife	
$10M	City of Airdrie and Area	
$10M	City of Côte Saint-Luc	
$10M	Saint Mary's First Nation and City of Fredericton	
$10M	City of Guelph and Wellington County	
$10M	Nunavut Communities (Group)	
$10M	Parkland, Brazeau, Lac Ste Anne and Yellowhead Counties	
$10M	City of Richmond	
$10M	City of Saskatoon	
$10M	Town of the Pas, Opaskwayak Cree Nation, R.M. of Kelsey (TriCouncil)	
$10M	Greater Victoria	
$50M	City of Edmonton	
$50M	City of Montréal	

$50M	Quebec City	[redacted]
$50M	City of Surrey and City of Vancouver	
$50M	Region of Waterloo (Group)	

ATIA - 21(1)(b)

ATIA - 19(1)

Jury Member:

$5 Million MOHAWK COUNCIL OF AKWESASNE

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
(1/5 or 2/10) Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
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(5/5 or 10/10) Exemplary demonstration with no weaknesses

Chapter 1: Vision (15 pts. Total)	Weight	Jury Score
Final proposal is driven by the Challenge Statement and carries through the vision laid out in the application	5 pts.	
Final proposal is transformative, scalable, and replicable within the community and to other communities in Canada	10 pts.	
		0

Chapter 2: Performance measurement (25 pts. Total)	Weight	Jury Score
Plan is detailed, complete, feasible, and well-suited to achieve the outcomes	10 pts.	
Plan forms a solid basis for development of outcomes-based contribution agreement	10 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Chapter 3: Project management (25 pts. Total)	Weight	Jury Score
Plan is detailed, complete, feasible, and well-suited to achievement of outcomes	10 pts.	
Plan supports the implementation of projects	10 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Chapter 4: Technology (25 pts. Total)	Weight	Jury Score
Plan is detailed, complete, feasible, and well-suited to achievement of outcomes	10 pts.	
Plan supports the implementation of projects	10 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Chapter 5: Governance (20 pts. Total)	Weight	Jury Score
Plan is detailed, complete, feasible, and well-suited to achievement of outcomes	10 pts.	
Plan, including partnerships, supports the implementation of projects	5 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Chapter 6: Engagement (30 pts. Total)	Weight	Jury Score
Engagement to date and plans to engage residents and other stakeholders in the implementation phase are detailed, complete, inclusive, meaningful, and well-suited to achieve the outcomes	10 pts.	
Plan supports the implementation of projects	5 pts.	
Diversity and inclusion are reflected in project design, and facilitate the implementation of projects	10 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Chapter 7: Data and privacy (25 pts. Total)	Weight	Jury Score
Plan is detailed, complete, high quality, and well-suited to achievement of outcomes	10 pts.	
Plan supports the implementation of projects	5 pts.	
Open and big data strategies are employed to the extent possible and facilitate transferability and replicability of technologies and projects	5 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Chapter 8: Financial (25 pts. Total)	Weight	Jury Score
Plan is detailed, complete, high quality, and well-suited to achievement of outcomes	10 pts.	
Plan supports the implementation of projects	5 pts.	
Report on the use of the finalist grant is detailed, complete, and demonstrates a rational and effective use for the development of the final proposal and sound management of project funding	5 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Chapter 9: Implementation phase requirements (10 pts. Total)	Weight	Jury Score
Plans for meeting relevant municipal, provincial, and federal reporting and legislative requirements are provided and serve as sufficient groundwork for the implementation phase should the finalist be selected as a winner	5 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

	Grand Total	0

Processed under the provisions of the Access to Information Act /Révisé en vertu de la Loi sur l'accès à l'information

Jury Member:

$5 Million BIIGTIGONG NISHNAABEG

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
(1/5 or 2/10) Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
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Chapter 1: Vision (15 pts. Total)	**Weight**	**Jury Score**
Final proposal is driven by the Challenge Statement and carries through the vision laid out in the application	5 pts.	
Final proposal is transformative, scalable, and replicable within the community and to other communities in Canada	10 pts.	
		0
Chapter 2: Performance measurement (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, feasible, and well-suited to achieve the outcomes	10 pts.	
Plan forms a solid basis for development of outcomes-based contribution agreement	10 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0
Chapter 3: Project management (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, feasible, and well-suited to achievement of outcomes	10 pts.	
Plan supports the implementation of projects	10 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0
Chapter 4: Technology (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, feasible, and well-suited to achievement of outcomes	10 pts.	
Plan supports the implementation of projects	10 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0
Chapter 5: Governance (20 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, feasible, and well-suited to achievement of outcomes	10 pts.	
Plan, including partnerships, supports the implementation of projects	5 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0
Chapter 6: Engagement (30 pts. Total)	**Weight**	**Jury Score**
Engagement to date and plans to engage residents and other stakeholders in the implementation phase are detailed, complete, inclusive, meaningful, and well-suited to achieve the outcomes	10 pts.	
Plan supports the implementation of projects	5 pts.	
Diversity and inclusion are reflected in project design, and facilitate the implementation of projects	10 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0
Chapter 7: Data and privacy (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, high quality, and well-suited to achievement of outcomes	10 pts.	
Plan supports the implementation of projects	5 pts.	
Open and big data strategies are employed to the extent possible and facilitate transferability and replicability of technologies and projects	5 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0
Chapter 8: Financial (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, high quality, and well-suited to achievement of outcomes	10 pts.	
Plan supports the implementation of projects	5 pts.	
Report on the use of the finalist grant is detailed, complete, and demonstrates a rational and effective use for the development of the final proposal and sound management of project funding	5 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0
Chapter 9: Implementation phase requirements (10 pts. Total)	**Weight**	**Jury Score**
Plans for meeting relevant municipal, provincial, and federal reporting and legislative requirements are provided and serve as sufficient groundwork for the implementation phase should the finalist be selected as a winner	5 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0
	Grand Total	0

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Jury Member:

$5 Million TOWN OF BRIDGEWATER

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
(1/5 or 2/10) Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
(2/5 or 4/10) Some good aspects, some questionable/weak demonstrations that need to be addressed
(3/5 or 6/10) Reasonably good demonstration on most aspects with some weaknesses that need addressing
(4/5 or 8/10) Very good demonstration on virtually all aspects some weaknesses of modest consequence
(5/5 or 10/10) Exemplary demonstration with no weaknesses

Chapter 1: Vision (15 pts. Total)	Weight	Jury Score
Final proposal is driven by the Challenge Statement and carries through the vision laid out in the application	5 pts.	
Final proposal is transformative, scalable, and replicable within the community and to other communities in Canada	10 pts.	
		0

Chapter 2: Performance measurement (25 pts. Total)	Weight	Jury Score
Plan is detailed, complete, feasible, and well-suited to achieve the outcomes	10 pts.	
Plan forms a solid basis for development of outcomes-based contribution agreement	10 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Chapter 3: Project management (25 pts. Total)	Weight	Jury Score
Plan is detailed, complete, feasible, and well-suited to achievement of outcomes	10 pts.	
Plan supports the implementation of projects	10 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Chapter 4: Technology (25 pts. Total)	Weight	Jury Score
Plan is detailed, complete, feasible, and well-suited to achievement of outcomes	10 pts.	
Plan supports the implementation of projects	10 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Chapter 5: Governance (20 pts. Total)	Weight	Jury Score
Plan is detailed, complete, feasible, and well-suited to achievement of outcomes	10 pts.	
Plan, including partnerships, supports the implementation of projects	5 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Chapter 6: Engagement (30 pts. Total)	Weight	Jury Score
Engagement to date and plans to engage residents and other stakeholders in the implementation phase are detailed, complete, inclusive, meaningful, and well-suited to achieve the outcomes	10 pts.	
Plan supports the implementation of projects	5 pts.	
Diversity and inclusion are reflected in project design, and facilitate the implementation of projects	10 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Chapter 7: Data and privacy (25 pts. Total)	Weight	Jury Score
Plan is detailed, complete, high quality, and well-suited to achievement of outcomes	10 pts.	
Plan supports the implementation of projects	5 pts.	
Open and big data strategies are employed to the extent possible and facilitate transferability and replicability of technologies and projects	5 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Chapter 8: Financial (25 pts. Total)	Weight	Jury Score
Plan is detailed, complete, high quality, and well-suited to achievement of outcomes	10 pts.	
Plan supports the implementation of projects	5 pts.	
Report on the use of the finalist grant is detailed, complete, and demonstrates a rational and effective use for the development of the final proposal and sound management of project funding	5 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Chapter 9: Implementation phase requirements (10 pts. Total)	Weight	Jury Score
Plans for meeting relevant municipal, provincial, and federal reporting and legislative requirements are provided and serve as sufficient groundwork for the implementation phase should the finalist be selected as a winner	5 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

		Grand Total	0

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Jury Member:

$5 Million CREE NATION OF EASTMAIN

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
(1/5 or 2/10) Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
(2/5 or 4/10) Some good aspects, some questionable/weak demonstrations that need to be addressed
(3/5 or 6/10) Reasonably good demonstration on most aspects with some weaknesses that need addressing
(4/5 or 8/10) Very good demonstration on virtually all aspects some weaknesses of modest consequence
(5/5 or 10/10) Exemplary demonstration with no weaknesses

Chapter 1: Vision (15 pts. Total)	**Weight**	**Jury Score**
Final proposal is driven by the Challenge Statement and carries through the vision laid out in the application	5 pts.	
Final proposal is transformative, scalable, and replicable within the community and to other communities in Canada	10 pts.	
		0
Chapter 2: Performance measurement (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, feasible, and well-suited to achieve the outcomes	10 pts.	
Plan forms a solid basis for development of outcomes-based contribution agreement	10 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0
Chapter 3: Project management (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, feasible, and well-suited to achievement of outcomes	10 pts.	
Plan supports the implementation of projects	10 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0
Chapter 4: Technology (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, feasible, and well-suited to achievement of outcomes	10 pts.	
Plan supports the implementation of projects	10 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0
Chapter 5: Governance (20 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, feasible, and well-suited to achievement of outcomes	10 pts.	
Plan, including partnerships, supports the implementation of projects	5 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0
Chapter 6: Engagement (30 pts. Total)	**Weight**	**Jury Score**
Engagement to date and plans to engage residents and other stakeholders in the implementation phase are detailed, complete, inclusive, meaningful, and well-suited to achieve the outcomes	10 pts.	
Plan supports the implementation of projects	5 pts.	
Diversity and inclusion are reflected in project design, and facilitate the implementation of projects	10 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0
Chapter 7: Data and privacy (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, high quality, and well-suited to achievement of outcomes	10 pts.	
Plan supports the implementation of projects	5 pts.	
Open and big data strategies are employed to the extent possible and facilitate transferability and replicability of technologies and projects	5 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0
Chapter 8: Financial (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, high quality, and well-suited to achievement of outcomes	10 pts.	
Plan supports the implementation of projects	5 pts.	
Report on the use of the finalist grant is detailed, complete, and demonstrates a rational and effective use for the development of the final proposal and sound management of project funding	5 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0
Chapter 9: Implementation phase requirements (10 pts. Total)	**Weight**	**Jury Score**
Plans for meeting relevant municipal, provincial, and federal reporting and legislative requirements are provided and serve as sufficient groundwork for the implementation phase should the finalist be selected as a winner	5 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0
	Grand Total	0

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Jury Member:

$5 Million CITY OF YELLOWKNIFE

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
(1/5 or 2/10) Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
(2/5 or 4/10) Some good aspects, some questionable/weak demonstrations that need to be addressed
(3/5 or 6/10) Reasonably good demonstration on most aspects with some weaknesses that need addressing
(4/5 or 8/10) Very good demonstration on virtually all aspects some weaknesses of modest consequence
(5/5 or 10/10) Exemplary demonstration with no weaknesses

Chapter 1: Vision (15 pts. Total)	**Weight**	**Jury Score**
Final proposal is driven by the Challenge Statement and carries through the vision laid out in the application	5 pts.	
Final proposal is transformative, scalable, and replicable within the community and to other communities in Canada	10 pts.	
		0
Chapter 2: Performance measurement (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, feasible, and well-suited to achieve the outcomes	10 pts.	
Plan forms a solid basis for development of outcomes-based contribution agreement	10 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0
Chapter 3: Project management (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, feasible, and well-suited to achievement of outcomes	10 pts.	
Plan supports the implementation of projects	10 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0
Chapter 4: Technology (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, feasible, and well-suited to achievement of outcomes	10 pts.	
Plan supports the implementation of projects	10 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0
Chapter 5: Governance (20 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, feasible, and well-suited to achievement of outcomes	10 pts.	
Plan, including partnerships, supports the implementation of projects	5 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0
Chapter 6: Engagement (30 pts. Total)	**Weight**	**Jury Score**
Engagement to date and plans to engage residents and other stakeholders in the implementation phase are detailed, complete, inclusive, meaningful, and well-suited to achieve the outcomes	10 pts.	
Plan supports the implementation of projects	5 pts.	
Diversity and inclusion are reflected in project design, and facilitate the implementation of projects	10 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0
Chapter 7: Data and privacy (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, high quality, and well-suited to achievement of outcomes	10 pts.	
Plan supports the implementation of projects	5 pts.	
Open and big data strategies are employed to the extent possible and facilitate transferability and replicability of technologies and projects	5 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0
Chapter 8: Financial (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, high quality, and well-suited to achievement of outcomes	10 pts.	
Plan supports the implementation of projects	5 pts.	
Report on the use of the finalist grant is detailed, complete, and demonstrates a rational and effective use for the development of the final proposal and sound management of project funding	5 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0
Chapter 9: Implementation phase requirements (10 pts. Total)	**Weight**	**Jury Score**
Plans for meeting relevant municipal, provincial, and federal reporting and legislative requirements are provided and serve as sufficient groundwork for the implementation phase should the finalist be selected as a winner	5 pts.	0
Risk strategy is thorough and adequately addresses key risks	5 pts.	0
		0
	Grand Total	0

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Jury Member:

$10 Million CITY OF AIRDRIE AND AREA

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
(1/5 or 2/10) Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
(2/5 or 4/10) Some good aspects, some questionable/weak demonstrations that need to be addressed
(3/5 or 6/10) Reasonably good demonstration on most aspects with some weaknesses that need addressing
(4/5 or 8/10) Very good demonstration on virtually all aspects some weaknesses of modest consequence
(5/5 or 10/10) Exemplary demonstration with no weaknesses

Chapter 1: Vision (15 pts. Total)	**Weight**	**Jury Score**
Final proposal is driven by the Challenge Statement and carries through the vision laid out in the application	5 pts.	
Final proposal is transformative, scalable, and replicable within the community and to other communities in Canada	10 pts.	
		0

Chapter 2: Performance measurement (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, feasible, and well-suited to achieve the outcomes	10 pts.	
Plan forms a solid basis for development of outcomes-based contribution agreement	10 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Chapter 3: Project management (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, feasible, and well-suited to achievement of outcomes	10 pts.	
Plan supports the implementation of projects	10 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Chapter 4: Technology (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, feasible, and well-suited to achievement of outcomes	10 pts.	
Plan supports the implementation of projects	10 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Chapter 5: Governance (20 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, feasible, and well-suited to achievement of outcomes	10 pts.	
Plan, including partnerships, supports the implementation of projects	5 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Chapter 6: Engagement (30 pts. Total)	**Weight**	**Jury Score**
Engagement to date and plans to engage residents and other stakeholders in the implementation phase are detailed, complete, inclusive, meaningful, and well-suited to achieve the outcomes	10 pts.	
Plan supports the implementation of projects	5 pts.	
Diversity and inclusion are reflected in project design, and facilitate the implementation of projects	10 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Chapter 7: Data and privacy (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, high quality, and well-suited to achievement of outcomes:	10 pts.	
Plan supports the implementation of projects:	5 pts.	
Open and big data strategies are employed to the extent possible and facilitate transferability and replicability of technologies and projects:	5 pts.	
Risk strategy is thorough and adequately addresses key risks:	5 pts.	
		0

Chapter 8: Financial (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, high quality, and well-suited to achievement of outcomes	10 pts.	
Plan supports the implementation of projects	5 pts.	
Report on the use of the finalist grant is detailed, complete, and demonstrates a rational and effective use for the development of the final proposal and sound management of project funding	5 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Chapter 9: Implementation phase requirements (10 pts. Total)	**Weight**	**Jury Score**
Plans for meeting relevant municipal, provincial, and federal reporting and legislative requirements are provided and serve as sufficient groundwork for the implementation phase should the finalist be selected as a winner	5 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0
	Grand Total	0

Processed under the provisions of the Access to Information Act /Révisé en vertu de la Loi sur l'accès à l'information

Jury Member:

$10 Million CITY OF CÔTE SAINT-LUC

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
(1/5 or 2/10) Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
(2/5 or 4/10) Some good aspects, some questionable/weak demonstrations that need to be addressed
(3/5 or 6/10) Reasonably good demonstration on most aspects with some weaknesses that need addressing
(4/5 or 8/10) Very good demonstration on virtually all aspects some weaknesses of modest consequence
(5/5 or 10/10) Exemplary demonstration with no weaknesses

Chapter 1: Vision (15 pts. Total)	**Weight**	**Jury Score**
Final proposal is driven by the Challenge Statement and carries through the vision laid out in the application	5 pts.	
Final proposal is transformative, scalable, and replicable within the community and to other communities in Canada	10 pts.	
		0

Chapter 2: Performance measurement (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, feasible, and well-suited to achieve the outcomes	10 pts.	
Plan forms a solid basis for development of outcomes-based contribution agreement	10 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Chapter 3: Project management (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, feasible, and well-suited to achievement of outcomes	10 pts.	
Plan supports the implementation of projects	10 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Chapter 4: Technology (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, feasible, and well-suited to achievement of outcomes	10 pts.	
Plan supports the implementation of projects	10 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Chapter 5: Governance (20 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, feasible, and well-suited to achievement of outcomes	10 pts.	
Plan, including partnerships, supports the implementation of projects	5 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Chapter 6: Engagement (30 pts. Total)	**Weight**	**Jury Score**
Engagement to date and plans to engage residents and other stakeholders in the implementation phase are detailed, complete, inclusive, meaningful, and well-suited to achieve the outcomes	10 pts.	
Plan supports the implementation of projects	5 pts.	
Diversity and inclusion are reflected in project design, and facilitate the implementation of projects	10 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Chapter 7: Data and privacy (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, high quality, and well-suited to achievement of outcomes:	10 pts.	
Plan supports the implementation of projects:	5 pts.	
Open and big data strategies are employed to the extent possible and facilitate transferability and replicability of technologies and projects:	5 pts.	
Risk strategy is thorough and adequately addresses key risks:	5 pts.	
		0

Chapter 8: Financial (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, high quality, and well-suited to achievement of outcomes	10 pts.	
Plan supports the implementation of projects	5 pts.	
Report on the use of the finalist grant is detailed, complete, and demonstrates a rational and effective use for the development of the final proposal and sound management of project funding	5 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Chapter 9: Implementation phase requirements (10 pts. Total)	**Weight**	**Jury Score**
Plans for meeting relevant municipal, provincial, and federal reporting and legislative requirements are provided and serve as sufficient groundwork for the implementation phase should the finalist be selected as a winner	5 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

	Processed under the provisions of the Access to Information Act /Révisé en vertu de la Loi sur l'accès à l'information	Page 136 of 1849	Grand Total	0

Jury Member:

$10 Million ST. MARY'S FIRST NATION AND CITY OF FREDERICTON

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
(1/5 or 2/10) Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
(2/5 or 4/10) Some good aspects, some questionable/weak demonstrations that need to be addressed
(3/5 or 6/10) Reasonably good demonstration on most aspects with some weaknesses that need addressing
(4/5 or 8/10) Very good demonstration on virtually all aspects some weaknesses of modest consequence
(5/5 or 10/10) Exemplary demonstration with no weaknesses

Chapter 1: Vision (15 pts. Total)	**Weight**	**Jury Score**
Final proposal is driven by the Challenge Statement and carries through the vision laid out in the application	5 pts.	
Final proposal is transformative, scalable, and replicable within the community and to other communities in Canada	10 pts.	
		0
Chapter 2: Performance measurement (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, feasible, and well-suited to achieve the outcomes	10 pts.	
Plan forms a solid basis for development of outcomes-based contribution agreement	10 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0
Chapter 3: Project management (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, feasible, and well-suited to achievement of outcomes	10 pts.	
Plan supports the implementation of projects	10 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0
Chapter 4: Technology (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, feasible, and well-suited to achievement of outcomes	10 pts.	
Plan supports the implementation of projects	10 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0
Chapter 5: Governance (20 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, feasible, and well-suited to achievement of outcomes	10 pts.	
Plan, including partnerships, supports the implementation of projects	5 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0
Chapter 6: Engagement (30 pts. Total)	**Weight**	**Jury Score**
Engagement to date and plans to engage residents and other stakeholders in the implementation phase are detailed, complete, inclusive, meaningful, and well-suited to achieve the outcomes	10 pts.	
Plan supports the implementation of projects	5 pts.	
Diversity and inclusion are reflected in project design, and facilitate the implementation of projects	10 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0
Chapter 7: Data and privacy (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, high quality, and well-suited to achievement of outcomes:	10 pts.	
Plan supports the implementation of projects:	5 pts.	
Open and big data strategies are employed to the extent possible and facilitate transferability and replicability of technologies and projects:	5 pts.	
Risk strategy is thorough and adequately addresses key risks:	5 pts.	
		0
Chapter 8: Financial (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, high quality, and well-suited to achievement of outcomes	10 pts.	
Plan supports the implementation of projects	5 pts.	
Report on the use of the finalist grant is detailed, complete, and demonstrates a rational and effective use for the development of the final proposal and sound management of project funding	5 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0
Chapter 9: Implementation phase requirements (10 pts. Total)	**Weight**	**Jury Score**
Plans for meeting relevant municipal, provincial, and federal reporting and legislative requirements are provided and serve as sufficient groundwork for the implementation phase should the finalist be selected as a winner	5 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0
	Grand Total	0

Processed under the provisions of the Access to Information Act /Révisé en vertu de la Loi sur l'accés à l'information

Jury Member:

$10 Million CITY OF GUELPH AND WELLINGTON COUNTY

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
(1/5 or 2/10) Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
(2/5 or 4/10) Some good aspects, some questionable/weak demonstrations that need to be addressed
(3/5 or 6/10) Reasonably good demonstration on most aspects with some weaknesses that need addressing
(4/5 or 8/10) Very good demonstration on virtually all aspects some weaknesses of modest consequence
(5/5 or 10/10) Exemplary demonstration with no weaknesses

Chapter 1: Vision (15 pts. Total)	**Weight**	**Jury Score**
Final proposal is driven by the Challenge Statement and carries through the vision laid out in the application	5 pts.	
Final proposal is transformative, scalable, and replicable within the community and to other communities in Canada	10 pts.	
		0
Chapter 2: Performance measurement (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, feasible, and well-suited to achieve the outcomes	10 pts.	
Plan forms a solid basis for development of outcomes-based contribution agreement	10 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0
Chapter 3: Project management (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, feasible, and well-suited to achievement of outcomes	10 pts.	
Plan supports the implementation of projects	10 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0
Chapter 4: Technology (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, feasible, and well-suited to achievement of outcomes	10 pts.	
Plan supports the implementation of projects	10 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0
Chapter 5: Governance (20 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, feasible, and well-suited to achievement of outcomes	10 pts.	
Plan, including partnerships, supports the implementation of projects	5 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0
Chapter 6: Engagement (30 pts. Total)	**Weight**	**Jury Score**
Engagement to date and plans to engage residents and other stakeholders in the implementation phase are detailed, complete, inclusive, meaningful, and well-suited to achieve the outcomes	10 pts.	
Plan supports the implementation of projects	5 pts.	
Diversity and inclusion are reflected in project design, and facilitate the implementation of projects	10 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0
Chapter 7: Data and privacy (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, high quality, and well-suited to achievement of outcomes:	10 pts.	
Plan supports the implementation of projects:	5 pts.	
Open and big data strategies are employed to the extent possible and facilitate transferability and replicability of technologies and projects:	5 pts.	
Risk strategy is thorough and adequately addresses key risks:	5 pts.	
		0
Chapter 8: Financial (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, high quality, and well-suited to achievement of outcomes	10 pts.	
Plan supports the implementation of projects	5 pts.	
Report on the use of the finalist grant is detailed, complete, and demonstrates a rational and effective use for the development of the final proposal and sound management of project funding	5 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0
Chapter 9: Implementation phase requirements (10 pts. Total)	**Weight**	**Jury Score**
Plans for meeting relevant municipal, provincial, and federal reporting and legislative requirements are provided and serve as sufficient groundwork for the implementation phase should the finalist be selected as a winner	5 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0
	Grand Total	0

Processed under the provisions of the Access to Information Act /Révisé en vertu de la Loi sur l'accés à l'information

Jury Member:

$10 Million NUNAVUT COMMUNITIES

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
(1/5 or 2/10) Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
(2/5 or 4/10) Some good aspects, some questionable/weak demonstrations that need to be addressed
(3/5 or 6/10) Reasonably good demonstration on most aspects with some weaknesses that need addressing
(4/5 or 8/10) Very good demonstration on virtually all aspects some weaknesses of modest consequence
(5/5 or 10/10) Exemplary demonstration with no weaknesses

Chapter 1: Vision (15 pts. Total)	**Weight**	**Jury Score**
Final proposal is driven by the Challenge Statement and carries through the vision laid out in the application	5 pts.	
Final proposal is transformative, scalable, and replicable within the community and to other communities in Canada	10 pts.	
		0

Chapter 2: Performance measurement (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, feasible, and well-suited to achieve the outcomes	10 pts.	
Plan forms a solid basis for development of outcomes-based contribution agreement	10 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Chapter 3: Project management (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, feasible, and well-suited to achievement of outcomes	10 pts.	
Plan supports the implementation of projects	10 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Chapter 4: Technology (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, feasible, and well-suited to achievement of outcomes	10 pts.	
Plan supports the implementation of projects	10 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Chapter 5: Governance (20 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, feasible, and well-suited to achievement of outcomes	10 pts.	
Plan, including partnerships, supports the implementation of projects	5 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Chapter 6: Engagement (30 pts. Total)	**Weight**	**Jury Score**
Engagement to date and plans to engage residents and other stakeholders in the implementation phase are detailed, complete, inclusive, meaningful, and well-suited to achieve the outcomes	10 pts.	
Plan supports the implementation of projects	5 pts.	
Diversity and inclusion are reflected in project design, and facilitate the implementation of projects	10 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Chapter 7: Data and privacy (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, high quality, and well-suited to achievement of outcomes:	10 pts.	
Plan supports the implementation of projects:	5 pts.	
Open and big data strategies are employed to the extent possible and facilitate transferability and replicability of technologies and projects:	5 pts.	
Risk strategy is thorough and adequately addresses key risks:	5 pts.	
		0

Chapter 8: Financial (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, high quality, and well-suited to achievement of outcomes	10 pts.	
Plan supports the implementation of projects	5 pts.	
Report on the use of the finalist grant is detailed, complete, and demonstrates a rational and effective use for the development of the final proposal and sound management of project funding	5 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Chapter 9: Implementation phase requirements (10 pts. Total)	**Weight**	**Jury Score**
Plans for meeting relevant municipal, provincial, and federal reporting and legislative requirements are provided and serve as sufficient groundwork for the implementation phase should the finalist be selected as a winner	5 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Grand Total	0

Processed under the provisions of the Access to Information Act /Révisé en vertu de la Loi sur l'accès à l'information

Jury Member:

$10 Million PARKLAND COUNTY (GROUP)

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
(1/5 or 2/10) Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
(2/5 or 4/10) Some good aspects, some questionable/weak demonstrations that need to be addressed
(3/5 or 6/10) Reasonably good demonstration on most aspects with some weaknesses that need addressing
(4/5 or 8/10) Very good demonstration on virtually all aspects some weaknesses of modest consequence
(5/5 or 10/10) Exemplary demonstration with no weaknesses

Chapter 1: Vision (15 pts. Total)	**Weight**	**Jury Score**
Final proposal is driven by the Challenge Statement and carries through the vision laid out in the application	5 pts.	
Final proposal is transformative, scalable, and replicable within the community and to other communities in Canada	10 pts.	
		0

Chapter 2: Performance measurement (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, feasible, and well-suited to achieve the outcomes	10 pts.	
Plan forms a solid basis for development of outcomes-based contribution agreement	10 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Chapter 3: Project management (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, feasible, and well-suited to achievement of outcomes	10 pts.	
Plan supports the implementation of projects	10 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Chapter 4: Technology (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, feasible, and well-suited to achievement of outcomes	10 pts.	
Plan supports the implementation of projects	10 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Chapter 5: Governance (20 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, feasible, and well-suited to achievement of outcomes	10 pts.	
Plan, including partnerships, supports the implementation of projects	5 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Chapter 6: Engagement (30 pts. Total)	**Weight**	**Jury Score**
Engagement to date and plans to engage residents and other stakeholders in the implementation phase are detailed, complete, inclusive, meaningful, and well-suited to achieve the outcomes	10 pts.	
Plan supports the implementation of projects	5 pts.	
Diversity and inclusion are reflected in project design, and facilitate the implementation of projects	10 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Chapter 7: Data and privacy (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, high quality, and well-suited to achievement of outcomes:	10 pts.	
Plan supports the implementation of projects:	5 pts.	
Open and big data strategies are employed to the extent possible and facilitate transferability and replicability of technologies and projects:	5 pts.	
Risk strategy is thorough and adequately addresses key risks:	5 pts.	
		0

Chapter 8: Financial (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, high quality, and well-suited to achievement of outcomes	10 pts.	
Plan supports the implementation of projects	5 pts.	
Report on the use of the finalist grant is detailed, complete, and demonstrates a rational and effective use for the development of the final proposal and sound management of project funding	5 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Chapter 9: Implementation phase requirements (10 pts. Total)	**Weight**	**Jury Score**
Plans for meeting relevant municipal, provincial, and federal reporting and legislative requirements are provided and serve as sufficient groundwork for the implementation phase should the finalist be selected as a winner	5 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Grand Total	0

Processed under the provisions of the Access to Information Act /Révisé en vertu de la Loi sur l'accès à l'information

Jury Member:

$10 Million CITY OF RICHMOND

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
(1/5 or 2/10) Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
(2/5 or 4/10) Some good aspects, some questionable/weak demonstrations that need to be addressed
(3/5 or 6/10) Reasonably good demonstration on most aspects with some weaknesses that need addressing
(4/5 or 8/10) Very good demonstration on virtually all aspects some weaknesses of modest consequence
(5/5 or 10/10) Exemplary demonstration with no weaknesses

Chapter 1: Vision (15 pts. Total)	**Weight**	**Jury Score**
Final proposal is driven by the Challenge Statement and carries through the vision laid out in the application	5 pts.	
Final proposal is transformative, scalable, and replicable within the community and to other communities in Canada	10 pts.	
		0

Chapter 2: Performance measurement (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, feasible, and well-suited to achieve the outcomes	10 pts.	
Plan forms a solid basis for development of outcomes-based contribution agreement	10 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Chapter 3: Project management (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, feasible, and well-suited to achievement of outcomes	10 pts.	
Plan supports the implementation of projects	10 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Chapter 4: Technology (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, feasible, and well-suited to achievement of outcomes	10 pts.	
Plan supports the implementation of projects	10 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Chapter 5: Governance (20 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, feasible, and well-suited to achievement of outcomes	10 pts.	
Plan, including partnerships, supports the implementation of projects	5 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Chapter 6: Engagement (30 pts. Total)	**Weight**	**Jury Score**
Engagement to date and plans to engage residents and other stakeholders in the implementation phase are detailed, complete, inclusive, meaningful, and well-suited to achieve the outcomes	10 pts.	
Plan supports the implementation of projects	5 pts.	
Diversity and inclusion are reflected in project design, and facilitate the implementation of projects	10 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Chapter 7: Data and privacy (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, high quality, and well-suited to achievement of outcomes:	10 pts.	
Plan supports the implementation of projects:	5 pts.	
Open and big data strategies are employed to the extent possible and facilitate transferability and replicability of technologies and projects:	5 pts.	
Risk strategy is thorough and adequately addresses key risks:	5 pts.	
		0

Chapter 8: Financial (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, high quality, and well-suited to achievement of outcomes	10 pts.	
Plan supports the implementation of projects	5 pts.	
Report on the use of the finalist grant is detailed, complete, and demonstrates a rational and effective use for the development of the final proposal and sound management of project funding	5 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Chapter 9: Implementation phase requirements (10 pts. Total)	**Weight**	**Jury Score**
Plans for meeting relevant municipal, provincial, and federal reporting and legislative requirements are provided and serve as sufficient groundwork for the implementation phase should the finalist be selected as a winner	5 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Grand Total	0

Processed under the provisions of the Access to Information Act /Révisé en vertu de la Loi sur l'accès à l'information

Jury Member:

$10 Million CITY OF SASKATOON

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
(1/5 or 2/10) Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
(2/5 or 4/10) Some good aspects, some questionable/weak demonstrations that need to be addressed
(3/5 or 6/10) Reasonably good demonstration on most aspects with some weaknesses that need addressing
(4/5 or 8/10) Very good demonstration on virtually all aspects some weaknesses of modest consequence
(5/5 or 10/10) Exemplary demonstration with no weaknesses

Chapter 1: Vision (15 pts. Total)	**Weight**	**Jury Score**
Final proposal is driven by the Challenge Statement and carries through the vision laid out in the application	5 pts.	
Final proposal is transformative, scalable, and replicable within the community and to other communities in Canada	10 pts.	
		0
Chapter 2: Performance measurement (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, feasible, and well-suited to achieve the outcomes	10 pts.	
Plan forms a solid basis for development of outcomes-based contribution agreement	10 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0
Chapter 3: Project management (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, feasible, and well-suited to achievement of outcomes	10 pts.	
Plan supports the implementation of projects	10 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0
Chapter 4: Technology (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, feasible, and well-suited to achievement of outcomes	10 pts.	
Plan supports the implementation of projects	10 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0
Chapter 5: Governance (20 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, feasible, and well-suited to achievement of outcomes	10 pts.	
Plan, including partnerships, supports the implementation of projects	5 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0
Chapter 6: Engagement (30 pts. Total)	**Weight**	**Jury Score**
Engagement to date and plans to engage residents and other stakeholders in the implementation phase are detailed, complete, inclusive, meaningful, and well-suited to achieve the outcomes	10 pts.	
Plan supports the implementation of projects	5 pts.	
Diversity and inclusion are reflected in project design, and facilitate the implementation of projects	10 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0
Chapter 7: Data and privacy (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, high quality, and well-suited to achievement of outcomes:	10 pts.	
Plan supports the implementation of projects:	5 pts.	
Open and big data strategies are employed to the extent possible and facilitate transferability and replicability of technologies and projects:	5 pts.	
Risk strategy is thorough and adequately addresses key risks:	5 pts.	
		0
Chapter 8: Financial (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, high quality, and well-suited to achievement of outcomes	10 pts.	
Plan supports the implementation of projects	5 pts.	
Report on the use of the finalist grant is detailed, complete, and demonstrates a rational and effective use for the development of the final proposal and sound management of project funding	5 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0
Chapter 9: Implementation phase requirements (10 pts. Total)	**Weight**	**Jury Score**
Plans for meeting relevant municipal, provincial, and federal reporting and legislative requirements are provided and serve as sufficient groundwork for the implementation phase should the finalist be selected as a winner	5 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0
	Grand Total	0

Processed under the provisions of the Access to Information Act /Révisé en vertu de la Loi sur l'accès à l'information

Jury Member:

$10 Million TOWN OF THE PAS, OPASKWAYAK CREE NATION, R.M. OF KELSEY

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
(1/5 or 2/10) Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
(2/5 or 4/10) Some good aspects, some questionable/weak demonstrations that need to be addressed
(3/5 or 6/10) Reasonably good demonstration on most aspects with some weaknesses that need addressing
(4/5 or 8/10) Very good demonstration on virtually all aspects some weaknesses of modest consequence
(5/5 or 10/10) Exemplary demonstration with no weaknesses

Chapter 1: Vision (15 pts. Total)	**Weight**	**Jury Score**
Final proposal is driven by the Challenge Statement and carries through the vision laid out in the application	5 pts.	
Final proposal is transformative, scalable, and replicable within the community and to other communities in Canada	10 pts.	
		0

Chapter 2: Performance measurement (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, feasible, and well-suited to achieve the outcomes	10 pts.	
Plan forms a solid basis for development of outcomes-based contribution agreement	10 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Chapter 3: Project management (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, feasible, and well-suited to achievement of outcomes	10 pts.	
Plan supports the implementation of projects	10 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Chapter 4: Technology (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, feasible, and well-suited to achievement of outcomes	10 pts.	
Plan supports the implementation of projects	10 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Chapter 5: Governance (20 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, feasible, and well-suited to achievement of outcomes	10 pts.	
Plan, including partnerships, supports the implementation of projects	5 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Chapter 6: Engagement (30 pts. Total)	**Weight**	**Jury Score**
Engagement to date and plans to engage residents and other stakeholders in the implementation phase are detailed, complete, inclusive, meaningful, and well-suited to achieve the outcomes	10 pts.	
Plan supports the implementation of projects	5 pts.	
Diversity and inclusion are reflected in project design, and facilitate the implementation of projects	10 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Chapter 7: Data and privacy (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, high quality, and well-suited to achievement of outcomes:	10 pts.	
Plan supports the implementation of projects:	5 pts.	
Open and big data strategies are employed to the extent possible and facilitate transferability and replicability of technologies and projects:	5 pts.	
Risk strategy is thorough and adequately addresses key risks:	5 pts.	
		0

Chapter 8: Financial (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, high quality, and well-suited to achievement of outcomes	10 pts.	
Plan supports the implementation of projects	5 pts.	
Report on the use of the finalist grant is detailed, complete, and demonstrates a rational and effective use for the development of the final proposal and sound management of project funding	5 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Chapter 9: Implementation phase requirements (10 pts. Total)	**Weight**	**Jury Score**
Plans for meeting relevant municipal, provincial, and federal reporting and legislative requirements are provided and serve as sufficient groundwork for the implementation phase should the finalist be selected as a winner	5 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

	Grand Total	0

Processed under the provisions of the Access to Information Act /Révisé en vertu de la Loi sur l'accès à l'information

Jury Member:

$10 Million GREATER VICTORIA

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
(1/5 or 2/10) Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
(2/5 or 4/10) Some good aspects, some questionable/weak demonstrations that need to be addressed
(3/5 or 6/10) Reasonably good demonstration on most aspects with some weaknesses that need addressing
(4/5 or 8/10) Very good demonstration on virtually all aspects some weaknesses of modest consequence
(5/5 or 10/10) Exemplary demonstration with no weaknesses

Chapter 1: Vision (15 pts. Total)	**Weight**	**Jury Score**
Final proposal is driven by the Challenge Statement and carries through the vision laid out in the application	5 pts.	
Final proposal is transformative, scalable, and replicable within the community and to other communities in Canada	10 pts.	
		0

Chapter 2: Performance measurement (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, feasible, and well-suited to achieve the outcomes	10 pts.	
Plan forms a solid basis for development of outcomes-based contribution agreement	10 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Chapter 3: Project management (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, feasible, and well-suited to achievement of outcomes	10 pts.	
Plan supports the implementation of projects	10 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Chapter 4: Technology (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, feasible, and well-suited to achievement of outcomes	10 pts.	
Plan supports the implementation of projects	10 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Chapter 5: Governance (20 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, feasible, and well-suited to achievement of outcomes	10 pts.	
Plan, including partnerships, supports the implementation of projects	5 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Chapter 6: Engagement (30 pts. Total)	**Weight**	**Jury Score**
Engagement to date and plans to engage residents and other stakeholders in the implementation phase are detailed, complete, inclusive, meaningful, and well-suited to achieve the outcomes	10 pts.	
Plan supports the implementation of projects	5 pts.	
Diversity and inclusion are reflected in project design, and facilitate the implementation of projects	10 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Chapter 7: Data and privacy (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, high quality, and well-suited to achievement of outcomes:	10 pts.	
Plan supports the implementation of projects:	5 pts.	
Open and big data strategies are employed to the extent possible and facilitate transferability and replicability of technologies and projects:	5 pts.	
Risk strategy is thorough and adequately addresses key risks:	5 pts.	
		0

Chapter 8: Financial (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, high quality, and well-suited to achievement of outcomes	10 pts.	
Plan supports the implementation of projects	5 pts.	
Report on the use of the finalist grant is detailed, complete, and demonstrates a rational and effective use for the development of the final proposal and sound management of project funding	5 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Chapter 9: Implementation phase requirements (10 pts. Total)	**Weight**	**Jury Score**
Plans for meeting relevant municipal, provincial, and federal reporting and legislative requirements are provided and serve as sufficient groundwork for the implementation phase should the finalist be selected as a winner	5 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Grand Total	0

Processed under the provisions of the Access to Information Act /Révisé en vertu de la Loi sur l'accès à l'information

Jury Member:

$50 Million CITY OF EDMONTON

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
(1/5 or 2/10) Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
(2/5 or 4/10) Some good aspects, some questionable/weak demonstrations that need to be addressed
(3/5 or 6/10) Reasonably good demonstration on most aspects with some weaknesses that need addressing
(4/5 or 8/10) Very good demonstration on virtually all aspects some weaknesses of modest consequence
(5/5 or 10/10) Exemplary demonstration with no weaknesses

Chapter 1: Vision (15 pts. Total)	**Weight**	**Jury Score**
Final proposal is driven by the Challenge Statement and carries through the vision laid out in the application	5 pts.	
Final proposal is transformative, scalable, and replicable within the community and to other communities in Canada	10 pts.	
		0
Chapter 2: Performance measurement (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, feasible, and well-suited to achieve the outcomes	10 pts.	
Plan forms a solid basis for development of outcomes-based contribution agreement	10 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0
Chapter 3: Project management (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, feasible, and well-suited to achievement of outcomes	10 pts.	
Plan supports the implementation of projects	10 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0
Chapter 4: Technology (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, feasible, and well-suited to achievement of outcomes	10 pts.	
Plan supports the implementation of projects	10 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0
Chapter 5: Governance (20 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, feasible, and well-suited to achievement of outcomes	10 pts.	
Plan, including partnerships, supports the implementation of projects	5 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0
Chapter 6: Engagement (30 pts. Total)	**Weight**	**Jury Score**
Engagement to date and plans to engage residents and other stakeholders in the implementation phase are detailed, complete, inclusive, meaningful, and well-suited to achieve the outcomes	10 pts.	
Plan supports the implementation of projects	5 pts.	
Diversity and inclusion are reflected in project design, and facilitate the implementation of projects	10 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0
Chapter 7: Data and privacy (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, high quality, and well-suited to achievement of outcomes	10 pts.	
Plan supports the implementation of projects	5 pts.	
Open and big data strategies are employed to the extent possible and facilitate transferability and replicability of technologies and projects	5 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0
Chapter 8: Financial (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, high quality, and well-suited to achievement of outcomes	10 pts.	
Plan supports the implementation of projects	5 pts.	
Report on the use of the finalist grant is detailed, complete, and demonstrates a rational and effective use for the development of the final proposal and sound management of project funding	5 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0
Chapter 9: Implementation phase requirements (10 pts. Total)	**Weight**	**Jury Score**
Plans for meeting relevant municipal, provincial, and federal reporting and legislative requirements are provided and serve as sufficient groundwork for the implementation phase should the finalist be selected as a winner	5 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0
	Grand Total	0

Processed under the provisions of the Access to Information Act /Révisé en vertu de la Loi sur l'accès à l'information

Jury Member:

$50 Million CITY OF MONTRÉAL

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
(1/5 or 2/10) Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
(2/5 or 4/10) Some good aspects, some questionable/weak demonstrations that need to be addressed
(3/5 or 6/10) Reasonably good demonstration on most aspects with some weaknesses that need addressing
(4/5 or 8/10) Very good demonstration on virtually all aspects some weaknesses of modest consequence
(5/5 or 10/10) Exemplary demonstration with no weaknesses

Chapter 1: Vision (15 pts. Total)	**Weight**	**Jury Score**
Final proposal is driven by the Challenge Statement and carries through the vision laid out in the application	5 pts.	
Final proposal is transformative, scalable, and replicable within the community and to other communities in Canada	10 pts.	
		0

Chapter 2: Performance measurement (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, feasible, and well-suited to achieve the outcomes	10 pts.	
Plan forms a solid basis for development of outcomes-based contribution agreement	10 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Chapter 3: Project management (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, feasible, and well-suited to achievement of outcomes	10 pts.	
Plan supports the implementation of projects	10 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Chapter 4: Technology (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, feasible, and well-suited to achievement of outcomes	10 pts.	
Plan supports the implementation of projects	10 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Chapter 5: Governance (20 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, feasible, and well-suited to achievement of outcomes	10 pts.	
Plan, including partnerships, supports the implementation of projects	5 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Chapter 6: Engagement (30 pts. Total)	**Weight**	**Jury Score**
Engagement to date and plans to engage residents and other stakeholders in the implementation phase are detailed, complete, inclusive, meaningful, and well-suited to achieve the outcomes	10 pts.	
Plan supports the implementation of projects	5 pts.	
Diversity and inclusion are reflected in project design, and facilitate the implementation of projects	10 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Chapter 7: Data and privacy (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, high quality, and well-suited to achievement of outcomes	10 pts.	
Plan supports the implementation of projects	5 pts.	
Open and big data strategies are employed to the extent possible and facilitate transferability and replicability of technologies and projects	5 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Chapter 8: Financial (25 pts. Total)	**Weight**	**Jury Score**
Plan is detailed, complete, high quality, and well-suited to achievement of outcomes	10 pts.	
Plan supports the implementation of projects	5 pts.	
Report on the use of the finalist grant is detailed, complete, and demonstrates a rational and effective use for the development of the final proposal and sound management of project funding	5 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Chapter 9: Implementation phase requirements (10 pts. Total)	**Weight**	**Jury Score**
Plans for meeting relevant municipal, provincial, and federal reporting and legislative requirements are provided and serve as sufficient groundwork for the implementation phase should the finalist be selected as a winner	5 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Grand Total	0

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Jury Member:

$50 Million QUEBEC CITY

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
(1/5 or 2/10) Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
(2/5 or 4/10) Some good aspects, some questionable/weak demonstrations that need to be addressed
(3/5 or 6/10) Reasonably good demonstration on most aspects with some weaknesses that need addressing
(4/5 or 8/10) Very good demonstration on virtually all aspects some weaknesses of modest consequence
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		0

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		0

Chapter 4: Technology (25 pts. Total)	**Weight**	**Jury Score**
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Risk strategy is thorough and adequately addresses key risks	5 pts.	
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Chapter 5: Governance (20 pts. Total)	**Weight**	**Jury Score**
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		0

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Chapter 8: Financial (25 pts. Total)	**Weight**	**Jury Score**
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Risk strategy is thorough and adequately addresses key risks	5 pts.	
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Plans for meeting relevant municipal, provincial, and federal reporting and legislative requirements are provided and serve as sufficient groundwork for the implementation phase should the finalist be selected as a winner	5 pts.	
Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Grand Total	0

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Jury Member:

$50 Million CITY OF VANCOUVER AND CITY OF SURREY

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
(1/5 or 2/10) Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
(2/5 or 4/10) Some good aspects, some questionable/weak demonstrations that need to be addressed
(3/5 or 6/10) Reasonably good demonstration on most aspects with some weaknesses that need addressing
(4/5 or 8/10) Very good demonstration on virtually all aspects some weaknesses of modest consequence
(5/5 or 10/10) Exemplary demonstration with no weaknesses

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Chapter 9: Implementation phase requirements (10 pts. Total)	**Weight**	**Jury Score**
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Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Grand Total	0

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Jury Member:

$50 Million WATERLOO REGION

Legend (based on criteria weight of 5 or 10 points)
(0/5 or 0/10) No demonstration
(1/5 or 2/10) Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
(2/5 or 4/10) Some good aspects, some questionable/weak demonstrations that need to be addressed
(3/5 or 6/10) Reasonably good demonstration on most aspects with some weaknesses that need addressing
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(5/5 or 10/10) Exemplary demonstration with no weaknesses

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Plan is detailed, complete, feasible, and well-suited to achievement of outcomes	10 pts.	
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Risk strategy is thorough and adequately addresses key risks	5 pts.	
		0

Grand Total	0

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COMPLETE CHECK FOR FINAL PROPOSAL

FINALIST:				
ASSESSED BY:				
VALIDATED BY:				
APPROVAL BY: *select one: Jenny Tremblay / Eric Poirier*				
DATE OF COMPLETION: *enter date when all completed boxes are checked*				
REQUIREMENTS	**COMPLETED**	**IF NOT COMPLETED, NOTE REASON**	**GUIDING PRINCIPLES**	**ACTIONS**
		SUBMISSION		
Submitted to infc.sc-vi.infc@canada.ca by 23:59 PST on March 5, 2019	☐		• No extensions will be granted • No exceptions will be made for lateness or technical problems (finalist must be able to show evidence of submission)	• # to contact finalist • If not resolved, # to flag to DG for decision
Final proposal is submitted	☐		• No extensions will be granted • There is flexibility on the finalist video until the end of the week	• Assessor to save everything in designated folders • # to contact finalist if anything is missing • If not resolved, # to flag to DG for decision
Finalist video is submitted	☐		• There is flexibility on the finalist video until the end of the week	• Assessor to save everything in designated folders • # to contact finalist if anything is missing • If not resolved, # to flag to DG for decision
Preliminary Privacy Impact Assessment or Preliminary Rationale Analysis	☐		• No extensions will be granted	• Assessor to save everything in designated folders • # to contact finalist if anything is missing • If not resolved, # to flag to DG for decision
		FINAL PROPOSAL		
Written in one of Canada's official languages	☐		• If the final proposal is submitted in a language other than English or French, a companion version in English or French is required from the finalist	• # to extract the executive summary from the final proposal and send it to translation (if a French final proposal, send the entire document to translation)
Generally readable (e.g. picture is not covering text, text are not overlapping)	☐		• If there are serious formatting issues that hinders readability, the finalist may need to resubmit	• # to do a scan of the final proposal and verify that all text and tables, graph, etc. could be read
Text-based and in either MS Word (.doc or .docx) or a fully readable, searchable, and selectable PDF (.pdf) format	☐		• Finalist may adjust the format for INFC posting purposes after the deadline	• # to verify with Comms if format is suitable for posting, given INFC web accessibility standards • If not suitable, # to contact finalist
No longer than 75 pages* (Financial chapter exempted) and in 12 point font	☐		• Finalist cannot adjust content after the deadline • If the text overall is smaller than 12 point font, INFC will adjust and evaluate within the new page count	• # to notify finalist if final proposal is over 75 pages • # to notify finalist if INFC had to adjust the font and page count

Contains an executive summary	☐			• # to QC and save translated version into the designated folder
Organized by these distinct chapters (not limited to these; not necessarily in the same order): • Vision • Performance measurement • Project management • Technology • Governance • Engagement • Data and privacy • Financial • Implementation phase requirements	☐	*List any other chapters if necessary*	• Finalist must have these chapters • Finalist can have more chapters • Finalist can change the order of the chapters	• If the chapters are not clearly labeled, # to do a light analysis of where the content may be and make a note for the Jury
FINALIST VIDEO				
No longer than five minutes	☐		• Finalist may cut down the time for INFC posting purposes after the deadline	• # to notify finalist if video is longer than five minutes and needs cutting down
Submitted as a file or in a downloadable format	☐		• Finalist may adjust the format for INFC posting purposes after the deadline	• # to verify with Comms if format is suitable for posting, given INFC web accessibility standards • If not suitable, # to contact finalist
CONFIDENTIAL ANNEX (OPTIONAL)				
Submitted if and only if required	☐			• # to flag with DG if confidential annex is lengthy

Stand-Up Meeting

Date March 5th

- Original folder = case intake team ONLY
  Extracted folder = we can use.
- Confidential annex + privacy impact = CONFIDENTIAL
  ∴ lock computer!
- Don't email to private email.

- Be careful when talking about finalists even in our ~~finalist~~ work space.

- Raymond Chabot = external assessment.

- Email = ATIPable.

- Our Role: Objective Public Servants serving Jury + Minister.

- FAIRNESS

OGD

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ATIA - 21(1)(b)

[redacted]

Changes to note to Mui on Roll-out
- add in 2.

Team Huddle March 5/19

1 [redacted]

2. FPs are coming in - at 4 now (+ videos)
↳ completeness checks - Susan doing this as they come in.
No issues so far.

3. Central Collab tests - successful for PC.
↳ repository for Jury + RCGT
↳ one source, not scattered only.
↳ partitioned access

4. Shantel - generic inbox + Jira

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Cardinal2, Patrick (INFC)

From: Poirier2, Eric (INFC)
Sent: March 6, 2019 4:39 PM
To: Long, Alexander (INFC); Bouchard, Kathleen (INFC); Hwang, Susan (INFC); Aizlewood, Amanda (INFC)
Cc: Tremblay, Jenny (INFC)
Subject: Final Proposal: Intake Completeness Check

Bonjour Team,

Thank you for providing me with the results of your completeness check analysis and for conducting the additional verifications requested.

There are a few follow-ups to be done as noted on some of the completeness checklists but those have no bearing on the content to be sent to our external expert reviewers at Raymond Chabot Grant Thornton or for the package to the Jury. Please prepare those packages for distribution and I will ok the sending on review in person with you.

Otherwise, please prepare the appropriate emails for sending to each of the finalists for my review and approval.

Merci encore pour tout le bon travail.

Eric Poirier

Directeur principal, Défi des villes intelligentes
Infrastructure Canada / Gouvernement du Canada
eric.poirier2@canada.ca / Tél: 613-957-2460 (nouveau!)

Senior Director, Smart Cities Challenge
Infrastructure Canada / Government of Canada
eric.poirier2@canada.ca / Tel: 613-957-2460 (new!)

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ATIA - 19(1)

Cardinal2, Patrick (INFC)

From: Poirier2, Eric (INFC)
Sent: March 6, 2019 5:36 PM
To: Tremblay, Jenny (INFC)
Subject: Fwd: Final Proposals

Fyi

Sent from my iPhone

Begin forwarded message:

> **From:** "Bouchard, Kathleen (INFC)" <kathleen.bouchard@canada.ca>
> **Date:** March 6, 2019 at 5:01:29 PM EST
> **To:** "Seto, David" [redacted]
> **Cc:** "Poirier2, Eric (INFC)" <eric.poirier2@canada.ca>, "Baird, Matthew (INFC)" <matthew.baird@canada.ca>
> **Subject: Final Proposals**
>
> Good afternoon David, as per the expert evaluation contract, the Smart Cities Challenge Final Proposals are now available for Raymond Chabot Grant Thornton's assessment via the Central Collab Sharing platform.
>
> You can view and download all the document from the Expert Review Zip file.
> You will note that each Finalist file contains 4 documents.
> 1. Final Proposal and Annexes
> 2. Letters of Support
> 3. Confidential PIA (tagged as CONF. for confidential)
> 4. Confidential Annex (tagged as CONF. for confidential)
>
> You may notice that not all finalists have items under #2 and #4, these were not a requirement.
> Feel free to give it a quick try and contact me if you have any questions about the proposals or need a hand with access.
>
> Kathleen

ATIA - 19(1)

Note to File – Decision on Completeness Check Approach and Follow-up

In undertaking the completeness check of final proposals submitted on March 5, 2019, it was determined that all proposals were "complete" and ready for assessment. The following issues were identified during this check with recommended actions:

- There were six proposals that exceeded the 75-page limit. However, the amount was determined to be within a reasonable variance (e.g. 1-2 pages) and was the result of omitting the cover and/or table of contents from the 75-page count.
- There were a few proposals that had a significant number and/or length of appendices. As guidance was provided to finalists that there would be no guarantee that any content (excluding the PPIA, letters of support, confidential annex, financial information) beyond the 75-page limit would be assessed by the Jury, but no limit on the number of appendices a finalist could include, it has been decided to include all submitted appendices as part of the proposal packages to the assessors and Jury

Drafted by: Alex Long

[redacted] 7 MARS 2019

Approved by: Eric Poirier, Senior Director

Approved by: Jenny Tremblay, Director General

[redacted] 7 MARS 2019

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ATIA - 21(1)(b)

March 7, 2019

Process and Calendar of Key Dates

March 07 Jury receives all 20 Finalist Proposals (due to file sizes and proper handling of confidential information, Central Collab will be the file repository for download)

- ✓ Jury members begin their review of the 20 final proposals, prioritizing files assigned to their working groups.
- ✓ City of Montreal and City of Quebec originals will be in French

March 18 Montreal and Quebec City English translations will be provided to the jury (exact date, TBD)

Mar. 7 - Mar 22

- ✓ Jury members review, preliminarily score and comment on their 5 priority proposals.
- ✓ Jury members have a sound understanding and are familiar with their 5 assigned priority proposals.
- ✓ Working groups connect to discuss/compare results/calibrate criteria rating. INFC will host a teleconference group discussion with each of the 4 groups.
- ✓ A working group representative will be designated to present the final proposal to the full Jury during the first deliberation.
- ✓ Jury members should continue review & preliminarily score all proposals [redacted]

April 9 INFC receives expert reviews

April 10 INFC provides a support package to Jury members, including expert reviews for download via Central Collab

- ✓ Jury members review the support package and continue their assessments.

April 10- 16 Jury members send questions or requests for clarification (if any) on the expert reviews

- ✓ INFC will collect questions from Jury members to forward to experts and seek responses prior to April 23
- ✓ As needed, experts can be available during the first deliberation

April 22 Travel to Ottawa for Session 1- Discussion and Deliberation

April 23-24 Session 1- Discussion and Deliberation

- ✓ Presentations of each final proposal
- ✓ Discuss proposal
- ✓ Calibration discussion on criteria rating, based on assessments to date
- ✓ Draft and send follow up questions to finalist for written response (500 words) and/or further questions to experts by May 1
- ✓ Draft output (tbd, e.g. preliminary consensus grid or select scores for each finalists)

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For consideration and further discussion: What is the output you would like to see out of the first deliberation? What tools would you want (e.g. voting tech, analysis of preliminary scores submitted in advance, live group scoring)?

BY May 1 INFC to consolidate finalist and expert responses to jury questions

May 2-3 Session 2- Consensus and Recommendation

- ✓ Consider finalist and experts answers
- ✓ Build the jury consensus scoring grid for each finalist
- ✓ Recommend 4 winners

For consideration and further discussion: what tools / activities would best support you in achieving this output?

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ATIA - 19(1)

Bouchard, Kathleen (INFC)

From: Bouchard, Kathleen (INFC)
Sent: March 7, 2019 4:31 PM
To: Aizlewood, Amanda (INFC); Poirier2, Eric (INFC)
Subject: FW: re' Annexes

Fyi

From: Bouchard, Kathleen (INFC)
Sent: March 7, 2019 4:26 PM
To: 'Seto, David' [redacted]
Cc: Baird, Matthew (INFC) <matthew.baird@canada.ca>
Subject: re' Annexes

Hi David, thank you for the early heads up on your assessement of the file and scope of work. After consulting with the team, I would advise as follows: RCGT should base their assessment on the content of the Chapters and the main body of the approx. 75 page proposals plus the financial information. The finalists are aware that they would be assessed on the 75 page proposals plus the financial information. (not the annexes).

Annexes:
The annexes should be treated as supplementary sources of information. If appropriate and useful, your SMEs may avail themselves of the information contained therein but should not feel the need to review the full annex. For example, the PPIA are not to be "assessed" but considered globally as part of the approach to Data and Privacy. The requirement was for finalists to produce one.

Please let me know if this is clear and if you have any other questions or concerns.
The earlier we address these things, the better.

Thanks again,

Kathleen
613-790-1838

Bouchard, Kathleen (INFC)

From: Bouchard, Kathleen (INFC)
Sent: March 7, 2019 10:17 AM
To: Long, Alexander (INFC); Hwang, Susan (INFC)
Cc: Poirier2, Eric (INFC)
Subject: File Status
Attachments: File Status.docx

Hi guys, here is the file status with comments based on what has been prepared for Jury and Experts.

W:\SMART CITIES\1. Secretariat\12. Intake\2. Final Proposals March 2019\Assessment

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File Status for sharing with the Jury and Experts

	1. FP	2. Letters	3. PPIA	4. ConAnnex	
Mohawk Council of Akwesasne	x	x	x	x	
Biigtigong Nishnaabeg	x		x	x	[redacted]
Town of Bridgewater	x	x	x	x	
Cree Nation of Eastmain	x	x	x		
City of Yellowknife	x		x		[redacted]
City of Airdrie and Area	x	x	x	x	
City of Côte Saint-Luc	x	x	x		
City of Fredericton Saint Mary's First Nation	x	x	x		
Guelph and Wellington County	x	x	x		
Nunavut Communities	x	x	x		[redacted]
Parkland	x	x	x	x	
City of Richmond	x	x	x	x	
City of Saskatoon	x	x	x		
Tri-Council	x		x		[redacted]
Greater Victoria	x	x	x	x	
Edmonton	x	x	x		
City of Montreal	x	x	x	x	
Quebec City	x	x	x		[redacted]
City of Surrey and City of Vancouver	x	x	x	x	
Region of Waterloo	x	x	x	x	

*Page issues: The Amount of content in the Annexes is extensive and heavily supports the chapters. A note to file regarding the use and application of page limit has been drafted.

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ATIA - 19(1)

Beute, Shantel (INFC)

From: Tremblay, Jenny (INFC)
Sent: March 7, 2019 2:05 PM
To: [redacted]
Cc: Bouchard, Kathleen (INFC); Poirier2, Eric (INFC); Cardinal2, Patrick (INFC); McKenzie, Vicki (INFC)
Subject: Final Smart Cities Challenge proposals available for download

Dear Smart Cities Jury Members,

As the Secretary to the Jury, it is my pleasure and privilege to let you know that the Smart Cites Challenge Finalist Proposals and tools for your evaluation are now accessible on Central Collab. As we mentioned on the call last week, the sharing platform now allows you to download all materials at once rather than individually. Instructions on accessing Central Collab and a description of the content available follow at the end of this message.

A few reminders:

- **Confidential info:** Please be mindful of the sensitive nature of some of the content. We tagged confidential components with "CONF" to denote their careful treatment due to privacy analyses, confidential commercial or other sensitive information entrusted to us by finalists and/or partners.
- **Discretion:** A respectful reminder of the need to be discrete and secretive about your notes, views, comments, etc., other than with your Jury colleagues and the INFC Secretariat supporting you.
- **Fairness:** While documents from finalists proposals are starting to be posted by finalists, please only evaluate the versions provided by INFC in case finalists make modifications or add information for the benefit of their residents.
- **Support:** The team will be reaching out to you in the next week to start finding time for working group discussions that may work for you.
- **Travel:** please do not hesitate to contact Vicki McKenzie on our team to help you book deliberation travel. The sooner booked, the better travel choices will be available to you.
- **Information to come:** Translations of two final proposals are expected by March 18. We will also circulate by email the links to the finalist videos once they are all on the finalists' websites.

I look forward to continuing to support you in your important task,

Jenny Tremblay

****

HOW TO ACCESS

Step 1: Accessing the proposals:

- Sign in to Central Collab
- If you don't remember your login info click on FORGOT YOUR PASSWORD OR USERNAME
- If you have any issues, contact Kathleen Bouchard through email or at (613)790-1838.

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Step 2: Downloading the files

[redacted]

ATIA - 16(2)

Step 3: Unzipping the Final Proposals

- Once saved onto your computer, you may have to unzip the folder to access the files.
  - MacOS: The file should automatically be unzipped into the same folder when you open it.
  - Microsoft Windows 10: Select the zipped folder and the "Compressed Folder Tools" should appear above. Select "Extract all" to unzip the files.



  - Microsoft Windows 7/8: Right-click the zipped folder and select "Extract All..." to unzip the files.
  -
  - If you are not running on the above operating systems, you may need to download an appropriate software, such as WinZIP.

Content:

20 Finalist sub-folders, each containing files specific to a finalist. You will notice that not all finalists have items under #2 and #4, these were not a requirement.

1. Finalist Proposal
2. Letters of support
3. Privacy Impact Assessments
4. Confidential Annex

- Jury Evaluation Grid.xslx for early scoring and comments (instruction and assignments in tabs)
- Process and Calendar
- Priority Assignment List
- Finalist Guide (English and French)

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ATIA - 21(1)(b)

Cardinal2, Patrick (INFC)

From: Tremblay, Jenny (INFC)
Sent: March 7, 2019 1:57 PM
To: INFC.O PR.ADMO.Users / Utilisateurs.PR.BSMA O.INFC; Keenan, Sean (INFC); Williams, Tushara (INFC); McKnight, Tahanee (INFC); FitzGerald, Gabrielle (INFC); Judge, Robert (INFC); Eyre, Jennifer (INFC); INFC|INFC (helen.smiley@canada.ca)
Cc: Poirier2, Eric (INFC); Brigit Knecht (brigit.knecht@canada.ca)
Subject: Smart Cities finalist videos

Hi colleagues!

As you may know, the 20 Smart Cities Challenge finalist proposals came in to INFC on March 5. Finalists have each produced videos describing/summarizing their projects, and most finalists have posted these online [redacted] If you are interested, you may want to take a look through some of these – they give a good flavour of what finalists plan to implement, if they become one of the four big prize winners.

Community	Finalist Video
Biigtigong Nishnaabeg	biigtigong.com/finalist-video
Cree Nation of Eastmain	
City of Yellowknife	YouTube
Mohawk Council of Akwesasne	akwesasne.ca/finalist-video
Town of Bridgewater	YouTube
Greater Victoria	YouTube
City of Guelph and Wellington County	YouTube
City of Airdrie and Area	YouTube
Nunavut Communities	YouTube
Town of the Pas, Opaskwayak Cree Nation, R.M. of Kelsey	YouTube
City of Richmond	YouTube
City of Saskatoon	YouTube
Parkland, Brazeau, Lac Ste Anne and Yellowhead Counties	
Saint Mary's First Nation and City of Fredericton	YouTube
City of Côte Saint-Luc	YouTube – accessible only to those with links
City of Edmonton	YouTube
Region of Waterloo	
City of Vancouver and City of Surrey	YouTube
Ville de Montréal	YouTube – EN / YouTube – FR
Ville de Québec	YouTube – EN / YouTube – FR

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BRIEFING NOTE TO THE MINISTER

SMART CITIES CHALLENGE FINAL PROPOSALS AND NEXT STEPS

(For Information)

PURPOSE

To provide a status update and next steps on the Smart Cities Challenge following receipt of the twenty final proposals.

HIGHLIGHTS/KEY CONSIDERATIONS

- **All final proposals were received.** The twenty Smart Cities Challenge final proposals and finalist videos were submitted on Tuesday, March 5, 2019. Finalists also submitted a Preliminary Privacy Impact Assessment and some also submitted an optional confidential annex, both containing sensitive information. For your information, please find attached a USB key (**Annex A**) containing:
    - Twenty finalist files with the final proposals and associated annexes. Confidential components are identified as "CONF" in the file title to denote the need for their careful treatment due to privacy analyses, confidential commercial or other sensitive information entrusted to us by finalists and their partners.
    - A document listing links to finalist videos on their respective websites (**Annex B**).
- **Final proposals will be posted online but the means have changed.** The department is currently in the process of translating the executive summaries for each of the twenty proposals for posting on the Infrastructure Canada website, along with links to the full final proposals (except for confidential information) available on the finalists' websites. While the department had originally intended to post the entire proposals on the INFC website, logistical issues (e.g. translation time and cost due to page volume) limit timely online posting. As of the date of this note, almost all finalist proposals have been posted online.
- **The expert review and evaluation process has started.** The period of March 6, 2019 to early May 2019 will be dedicated to the expert review and the Jury evaluation of the final proposals.
    - The final proposals and associated annexes have been provided to the Smart Cities Challenge Jury as well as to the expert review contractor (Raymond Chabot Grant Thornton, selected following a solutions-based Request for Proposal procurement process).

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- The Jury can immediately start familiarising themselves with the proposals and evaluate the final proposals against the criteria.
- Expert reviews will also be prepared by departmental officials (and other federal departments and agencies, as required) on certain components of the final proposals.
- A Jury Support Package will be provided containing all expert reviews as input to the Jury's ongoing evaluation.
- The Jury will meet in person in Ottawa on two occasions for deliberations--on April 23-24 and on May 2-3.

- **Your decision will be sought in May.** On May 3, the department will prepare a decision note to present the Jury's recommended slate of four winners for your consideration and approval. A quick decision will be required for the planned announcement of winners on May 14, 2019 at the National Arts Centre.

NEXT STEPS

- As soon as possible after May 3, 2019, you will receive the Jury's recommendation of winners for each of the Smart Cities Challenge prizes: one $50 million, two $10 million and one $5 million.

Kelly Gillis
Deputy Minister
Infrastructure and Communities

Date

Attachment(s):

Annex A – Twenty Final Proposals from the Smart Cities Challenge Finalists (USB Key)
Annex B – Smart Cities Challenge Finalist Video links

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Smart Cities Challenge Finalist Videos

Finalist's Smart Cities Website	Finalist Video
Biigtigong Nishnaabeg https://biigtigong.com/language/publications/smart-cities-challenge/	https://biigtigong.com/language/publications/smart-cities-challenge/final-proposal/finalist-video/
Cree Nation of Eastmain http://www.eastmain.ca/	Coming soon!
City of Yellowknife https://www.yellowknife.ca/en/Smart_City.asp	https://www.youtube.com/watch?v=SxpUnpA8WYM
Mohawk Council of Akwesasne http://www.akwesasne.ca/smartakwesasne/	http://www.akwesasne.ca/smartakwesasne/
Town of Bridgewater http://www.bridgewater.ca/smartcities	https://www.youtube.com/watch?v=hp0Ay4NTmeI
Greater Victoria http://www.southislandprosperity.ca/scc/	https://www.youtube.com/watch?v=qG-SX4FotRw
City of Guelph **Wellington County** http://foodfuture.ca/	https://youtu.be/C83oDG0SE5E
City of Airdrie and Area https://healthsmartairdrie.ca/	https://www.youtube.com/watch?v=40G57OsuUX4
Nunavut Communities https://katinnganiq.pinnguaq.com/	https://youtu.be/fq-YZU9_xpU

Town of the Pas **Opaskwayak Cree Nation** **R.M. of Kelsey** https://www.thepascdc.com/smart-cities	https://www.youtube.com/watch?v=JfTq0Gxr0wE&feature=youtu.be
City of Richmond http://smartcity.richmond.ca/	https://www.youtube.com/watch?v=SL5oMOR5uv0
City of Saskatoon https://www.saskatoon.ca/engage/smart-cities-challenge	https://www.youtube.com/watch?v=AzZN_fVf29s
Parkland County **Brazeau County** **Lac Ste Anne County** **Yellowhead County** https://www.parklandcounty.com/en/do-business/smart-parkland.aspx	https://www.youtube.com/watch?v=gZg3xk9E-w0
Saint Mary's First Nation **City of Fredericton** http://www.fredericton.ca/smartcity	https://youtu.be/X0E_N5JJBR8?list=PLC5jlGaBu0q3gx_HapHLGFd8oQkO6O3R
City of Côte Saint-Luc https://www.smartcsl.org/	https://www.youtube.com/watch?v=CO-kivG1Si8
City of Edmonton https://www.engagewr.ca/SWR	https://www.youtube.com/watch?v=bLrL-4VVc9g
Smart Waterloo Region https://www.regionofwaterloo.ca/en/doing-business/smart-waterloo-region.aspx	Coming soon!

City of Vancouver **City of Surrey** https://www.smartertogether.ca/	https://www.youtube.com/watch?v=1xwO7K2CVRQ
Ville de Montréal https://www.realisonsmtl.ca/defi	English Video https://www.youtube.com/watch?v=BmLNKm3hGZY French Video https://www.youtube.com/watch?v=fois8Ug-x90e
Ville de Québec https://www.ville.quebec.qc.ca/villeintelligente/defi/	English Video https://www.youtube.com/watch?v=7zu1VZzd6dI French Video https://youtu.be/FdWLt-8-MeI

Bouchard, Kathleen (INFC)

From: Bouchard, Kathleen (INFC)
Sent: March 8, 2019 10:40 AM
To: Tremblay, Jenny (INFC)
Subject: Data and privacy

Chapter 7: Data and privacy (25 pts. Total)	Weight
Plan is detailed, complete, high quality, and well-suited to achievement of outcomes	10 pts.
Plan supports the implementation of projects	5 pts.
Open and big data strategies are employed to the extent possible and facilitate transferability and replicability of technologies and projects	5 pts.
Risk strategy is thorough and adequately addresses key risks	5 pts.

Kathleen Bouchard

Senior Analyst, Smart Cities Challenge
Infrastructure Canada / Government of Canada
kathleen.bouchard@canada.ca / Tel: 613-790-1838

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ATIA - 19(1)

ATIA - 21(1)(b)

Bouchard, Kathleen (INFC)

From: Seto, David [redacted]
Sent: March 11, 2019 10:09 AM
To: Bouchard, Kathleen (INFC)
Cc: Baird, Matthew (INFC)
Subject: RE: re' Annexes

Hi Kathleen,

That should work. We will update the tool in advance of completing [redacted] evaluation and include it in our first draft of the Preliminary Assessment Report.

Regards,

David

David Seto | Senior Director, Advisory Services
Raymond Chabot Grant Thornton
Direct Line + [redacted] Mobile + [redacted]
116 Albert Street, Suite 1000, Ottawa, ON K1P 5G3

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From: Bouchard, Kathleen (INFC) <kathleen.bouchard@canada.ca>
Sent: Sunday, March 10, 2019 7:26 PM
To: Seto, David [redacted]
Cc: Baird, Matthew (INFC) <matthew.baird@canada.ca>
Subject: Fwd: re' Annexes

Hi David, from our perspective, the tool can remain as is. The jury will consult the Expert advice on a section by section basis as needed (not so much in a linear chapter order). They too will be using an excel scoring sheet that uses the suggested chapter order from the finalist guide but will adapt to the order of the proposals.

While the tool associates chapter numbers to topics, you could simply remove the word "Chapter" and evaluate the topics in a consistent order regardless of the actual order of the proposal.

Hope this works, we'd be happy to meet tomorrow or anytime this week to look at how this impacts the work and better understand your issue so we can find a simple solution.

Kathleen
613-790-1838

Sent from my iPhone

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ATIA - 19(1)

ATIA - 21(1)(b)

On Mar 9, 2019, at 8:24 PM, Seto, David [redacted] wrote:

Hi Kathleen,

Thanks for the feedback.

What I intended to note about the model, was that, for example, Chapter 2 in the tool is Performance Measurement, while Chapter 2 for [redacted] is Community Engagement and Chapter 5 is Performance Measurement. Would you like us to rename the links and worksheets related to Chapter 2 in tool (i.e. The first evaluation chapter in our tool) to be Chapter 5, so that Performance Measurement remains in the same place in all models and Summary Sheets) or move Performance Measurement to the place in the model where Chapter 5 (I.e. Governance) current exists? I think both could create some confusion when it comes to reviewing the summary pages, but the former would be easiest for comparison sake.

Kindest Regards,

David

David Seto MBA | Senior Director, Advisory Services
Raymond Chabot Grant Thornton
Direct Line [redacted] | Mobile [redacted] | Fax 1-613-760-3530
116 Albert Street, Suite 1000 Ottawa, ON K1P 5G3
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Think about the environment before printing this email.

On Mar 9, 2019, at 5:23 PM, Bouchard, Kathleen (INFC) <kathleen.bouchard@canada.ca> wrote:

> Hi David, the tool originally proposed can very well work even if the chapters vary in order. Feel free to maintain your tool's structure, just assess and report back on the chapters based on their topics. The tool does not need to be customized to align with the order of the proposals.
>
> [redacted] works for the preliminary assessment. Thank you!
>
> Kathleen

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613-857-5754

Sent from my iPhone

ATIA - 19(1)

ATIA - 21(1)(b)

On Mar 9, 2019, at 3:37 PM, Seto, David [redacted] wrote:

> Hi Kathleen,
>
> Thanks for getting back to me so quickly.
>
> With respect to the Chapter "Names" and "Order", our Evaluation Tool and our Report Structure were developed to align with the Chapters as defined in the Finalist Guide. Are you comfortable with us leaving the evaluation tool and report structure in the order prescribed by the Finalist Guide (with perhaps a cross reference to the actual section numbers and names from the proposals) or are you proposing that we create a custom tool and report structure for each proposal, that doesn't already align with the Finalist Guide, based on how they elected to present their sections? The later would require additional time and effort and I also believe it would lead to confusion when comparing evaluation results against each other.
>
> [redacted]
>
> Kindest Regards,
>
> David

David Seto | Senior Director, Advisory Services
Raymond Chabot Grant Thornton
Direct Line [redacted] | Mobile [redacted]
116 Albert Street, Suite 1000, Ottawa, ON K1P 5G3



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ATIA - 19(1)

From: Bouchard, Kathleen (INFC) <kathleen.bouchard@canada.ca>
Sent: Friday, March 8, 2019 5:07 PM
To: Seto, David [redacted]
Cc: Blackman, Nicol [redacted]; Jia, Yuchen [redacted] Baird, Matthew (INFC) <matthew.baird@canada.ca>
Subject: re' Annexes

Hi David, please see our responses in red included in the body of the email below.
Hope this covers any questions, let me know if you need anything else.

Kathleen Bouchard

Senior Analyst, Smart Cities Challenge
Infrastructure Canada / Government of Canada
kathleen.bouchard@canada.ca / Tel: 613-790-1838

The Project Team and the SMEs met this morning to go over the summaries of the proposals and would like to confirm a couple things with you:

1. We will not be referring to, or considering, the Annexes in our evaluation (w/the exception of Chapter 8: Financials (if included as an Annex) and the PIA/PRA). We do not feel that looking at some and not all of the annexes would lend itself to a fair and/or equitable evaluation and potentially opening the door to challenges from communities that abided by the instructions provided in the Finalist Guide: ***"As concise as possible; no longer than 75***

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pages in 12 point font (no page limit on the Financial chapter outlined in Section 5.9)". Based on our conversation yesterday, it is my understanding that INFC has already informed the applicants that the Annexes would not be considered in the evaluation process.

- We support this approach. We would ask that you provide an overarching statement that points to this in your review documents. *"(...) in the spirit of fairness and based on the criteria in the Finalist Guide... RCGT will not be referring to, or considering, the Annexes in our evaluation (w/the exception of Chapter 8: Financials (if included as an Annex) and the PIA/PRA) (...)"*

2. Based upon the following criteria presented in the Finalist Guide:

   "As concise as possible; no longer than 75 pages in 12 point font (no page limit on the Financial chapter outlined in Section 5.9)".

   How would you like us to treat the proposals that exceeded 75 pages in the body of the proposals? For example:

   - [redacted] Body of Proposal excluding Chapter 8 (Financials) totals 76 pages.

- Following a completeness check, we have deemed that all the proposals were eligible and within an acceptable page range (overage includes covers, graphics and table of contents...) Our intention is not to ignore or disqualify

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proposals for minor derogations from the page limit.

3. Based upon the following criteria from the Finalist Guide:

> ***"Following an executive summary, there are nine chapters that are required for your final proposal:***
> ***1.Vision***
> ***2.Performance measurement***
> ***3.Project management***
> ***4.Technology***
> ***5.Governance***
> ***6.Engagement***
> ***7.Data and privacy***
> ***8.Financial***
> ***9.Implementation phase requirements"***

How would you like us to consider the respondents whose Chapters/Sections do no align with the Chapters specified in the Finalist Guide? The Chapters should be evaluated based on their topics (order is not so important). Finalists were allowed to organize the flow of information in the way that works best for them. In our completeness check we validated that the program chapters were there albeit in a different order than that suggested. In one instance the title of the Chapter was slightly reworded, let us know if you require support identifying the chapters.

For Example:

- [redacted]

Proposal has Chapters 8

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and 9 reversed (i.e. Chapter 8 is the Implementation Plan and Chapter 9 is the Financials section. Would you like us to evaluate them Chapter 9 as their response to the requirements for Chapter 8?

- [redacted] Proposal does not correctly align their responses to the appropriate Chapters (Chapter 2 is Community Engagement, should be Performance Measurement, Chapter 3 is Technology, should be Project Management, Chapter 4 is Project Management, should be Technology, Chapter 5 is Performance Measurement, should be Governance, Chapter 6 is Governance, should be Engagement, Chapter 9 is Risk Management (should not be a Chapter on its own), should be Implementation Phase Requirements. Finalists exercised discretion to add a well identified Risk Chapter which you should cross-reference and use

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to evaluate risks for the associated topics: Engagement – Technology – Program Management – Performance measurement – Governance – Data and Privacy – Finance – Implementation

- [redacted] Proposal does not name their sections by chapter and they are not in the order specified in the Finalist Guide. (The table of Content shows the order and content)
- [redacted] Proposal does not correctly align Chapters to those specified in the Finalist Guide
  The Financial annex at the end should be considered as the Financial Chapter
- [redacted] Proposal does not correctly align Chapters to those specified in the Finalist Guide
- [redacted] Proposal does not correctly align Chapters to those specified in the Finalist Guide
  The Risk Strategy from pages 60 – 67 should be used to evaluate risks for the associated topics

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Kindest Regards,

ATIA - 19(1)

David

David Seto | Senior Director, Advisory Services
Raymond Chabot Grant Thornton
Direct Line [redacted] Mobile [redacted]
116 Albert Street, Suite 1000, Ottawa, ON K1P 5G3



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From: Bouchard, Kathleen (INFC) <kathleen.bouchard@canada.ca>
Sent: Thursday, March 7, 2019 4:26 PM
To: Seto, David [redacted]
Cc: Baird, Matthew (INFC) <matthew.baird@canada.ca>
Subject: re' Annexes

Hi David, thank you for the early heads up on your assessement of the file and scope of work. After consulting with the team, I would advise as follows: RCGT should base their assessment on the content of the Chapters and the main body of the approx. 75 page proposals plus the financial information. The finalists are aware that they would be assessed on the 75 page proposals plus the financial information. (not the annexes).

Annexes:
The annexes should be treated as supplementary sources of information. If appropriate and useful, your SMEs may avail themselves of the information contained therein but should not feel the need to review the full annex. For example, the PPIA are not to be "assessed" but considered globally as part of the approach to Data

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and Privacy. The requirement was for finalists to produce one.

Please let me know if this is clear and if you have any other questions or concerns.
The earlier we address these things, the better.

Thanks again,

Kathleen
613-790-1838

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Aizlewood, Amanda (INFC)

Subject:	Information Session - Reviews of Final Proposals
Location:	Collab Table
Start:	Tue 2019-03-12 1:30 PM
End:	Tue 2019-03-12 2:00 PM
Show Time As:	Tentative
Recurrence:	(none)
Meeting Status:	Not yet responded
Organizer:	Aizlewood, Amanda (INFC)
Required Attendees:	Eric Poirier2 (INFC) (eric.poirier2@canada.ca); Kathleen Bouchard (INFC) (kathleen.bouchard@canada.ca); Susan Hwang (INFC) (susan.hwang@canada.ca); Long, Alexander (INFC); Matthew Baird (INFC) (matthew.baird@canada.ca); Sirna, Josie (INFC)

ATTACHED GUIDANCE DOCUMENT AND GRID

Hi gang,
As mentioned this morning at the huddle, Kathleen and I will lead a short information/Q&A session Tuesday afternoon to go over the review guidelines for the three chapters (Vision, Engagement and Implementation Phase Requirements). We will send out the guidance document in advance of the meeting.
Thanks!
Amanda


Evaluation Grid for 1-6-9.xlsx...


SCCD Internal Review Approac...

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MARCH 11, 2019

INTERNAL REVIEW OF VISION, ENGAGEMENT AND IMPLEMENTATION PHASE REQUIREMENTS CHAPTERS OF FINAL PROPOSALS – APPROACH AND GUIDELINES

Objective

To ensure that the best possible support to the Jury and, ultimately, to the Minister for their deliberations, recommendations and choice of winners, Smart Cities Challenge Directorate (SCCD) is coordinating reviews of the twenty final proposals. Separately, in-depth technical reviews will be undertaken by a contracted external firm (Raymond Chabot Grant Thornton (RCGT)) for six chapters of the final proposals, and three chapters will be reviewed by the Smart Cities Challenge team in consultation with other government departments (OGDs), if required. These reviews will result in the creation of support packages for the Jury.

This document details the approach to the internal reviews undertaken by SCCD. It includes the scope of work, timelines, dedicated resources, and information about assessment guidelines, rubrics and tools.

Scope of Work

SCCD will produce and provide preliminary assessments for the following chapters of the final proposals:

- Vision
- Engagement
- Implementation Phase Requirements

These assessments will be packaged with the external expert assessments delivered by RCGT and shared with the Jury.

Dedicated Resources

To undertake this review in a consistent, timely and proficient manner, SCCD's Program team will commit seven staff members over a period of six weeks (March 5 - April 18) to complete the reviews and provide support packages to the Jury.

Implicated staff are expected to conduct a reorganization of priorities in order to ensure that this work is completed in addition to core regular duties. In the event that supplementary hours are necessary, they should be flagged and approved by management in advance.

The following Review Teams will be established:

Prize Category	Staff
$5 million	Matt Baird and Josie Sirna
$10 million	Susan Hwang and Alex Long
$50 million	Kathleen Bouchard and Amanda Aizlewood (includes French language proposals)

Reviewers will work both independently and in their Review Teams to ensure consistency of approach and product. Reviewers will work together to draft single consolidated assessments for each proposal.

A Review Committee will be established to ensure consistency across reviewers. Membership will consist of all Review Team members and by other members of SCCD as deemed appropriate by management.

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Work Plan and Timeline

Work will be undertaken from March 8-April 9 inclusively. This timeframe takes into account the need for coordinated support from additional subject area experts within SCCD, INFC, OGDs, and other resources as needed.

Work will proceed according to the following schedule:

Date	Tasks and Deliverables
March 8	Final Proposals assigned and distributed to SCCD reviewers/Review Teams Guidelines and assessment tools (template, criterial interpretation and evaluation grid) distributed to SCCD reviewers/Review Teams
March 8-22	Reviewers independently complete reviews of Vision, Engagement and Implementation Phase Requirements chapters, consulting additional internal and external subject matter experts as necessary Review Team members meet to produce consolidated reviews within prize categories Review Teams across prize categories consult regularly to compare consistency of tone and approach
March 23-29	Upon receipt of preliminary technical review reports from RCGT, Review Teams align their reports with respect to tone and presentation (where necessary/possible)
March 31 - April 5	Reviews are verified for consistency and accuracy by Review Committee
April 8-9	Final technical review reports received from RCGT Final reviews are revised as necessary Jury packages are produced and finalized for each Final Proposal and submitted to Review Committee for final approval Review Committee approves final Jury packages
April 10	Senior management approves final Jury package Review packages sent to Jury

Review Guidelines

The evaluation criteria used by SCCD reviewers are the same as those used by the Jury and by the external technical reviewers. This will ensure consistency and ease during the consolidating phase of the work plan.

The evaluation criteria and helpful rubrics can be found in Annex A to this document. Reviewers will use these criteria, as laid out in the Smart Cities Challenge Finalist Guide, and will provide preliminary quantitative summations and short qualitative rationale for each criterion. Reviewers will record their quantitative and qualitative assessments in the assessment template, found here (W:\Smart Cities\1. Secretariat\4. Dev. and Design\Competition 1 - Evaluation of Finalists\2. SCCD Evaluating Chapt. 1-6-9)\Evaluation Grid for 1-6-9). Qualitative rationale should identify and reference key elements, including strengths and weaknesses. These narratives should be no longer than a half page per chapter.

General Guidance

Evaluation considerations specific to each chapter are outlined below. In addition to these specific considerations, reviewers should take note of the following general guidance:

- *Purpose*. The purpose of the internal and external assessment/review process is not to fully evaluate or rank the merit of the Final Proposals. The purpose is to provide the Jury and ultimately

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the Minister with comprehensive and considered summaries of the key strengths and weaknesses of the submissions so that they may take this information into account during their deliberations.

- *Comprehensive Approach*. While reviews are produced on a chapter-by-chapter basis, reviews should be approached with a comprehensive vision of the entire proposal; reviewers are expected to read the majority (or entirety) of the final proposals to determine if the content of each chapter reflects and upholds the proposal's key points and intentions.

- *Risk-based Approach*. Since they are not subject matter experts, reviewers are expected to employ a rational and risk-based approach to these reviews. If there are doubts raised by the content, for instance if links between core elements seem tenuous, there are clear gaps in the proposal or if there are legal or regulatory elements which seem pertinent but are not considered or addressed, a risk-based approach can flag these and lead to further investigation. Reviewers are encouraged to note problem areas, to discuss them other reviewers and flag them to management as necessary.

Vision

The Vision chapter brings the proposal together. This chapter should coherently present the overall objectives of the proposal as well as the "journey" of each finalist from initial application to final proposal. This should include a comprehensive presentation of the vision and Challenge Statement, and a demonstration of how these continue to respond to community needs. It is expected that some evolution will have taken place between the initial application and the submission of the final proposal. You are expected to consider this evolution and assess whether any deviations are explainable and reasonable.

The vision and Challenge Statement should clearly map to outcomes. As such, a review of this chapter requires a thorough assessment of the flow and linkages between the desired result and outcomes in the Challenge Statement and the relevance of the approach to each merit criterion (vision, transformative, scalability, replicability). This will require a thorough reading of the entire proposal.

Reviewers may consult the opinions rendered by the external supplier or by the OGD experts that were engaged on the initial application as part of their review. For further information on OGD experts, see Kathleen.

Engagement

This chapter requires that finalists demonstrate their plan to continue the engagement of residents and stakeholders during the implementation phase of their project should they be selected as a winner. As such, this chapter should provide a clear and coherent plan for engagement during the implementation phase. It should detail the engagement strategy, lessons learned from the application and proposal development phases, and the types of tools used to encourage engagement. Finalists are also expected to consider diversity and inclusion in the development of their engagement plan and to reflect the risks and issues.

Detailed guidance related to diversity and inclusion can be found here: https://impact.canada.ca/en/challenges/smart-cities/finalist-guide#appendix1. Reviewers may also consult the webinar deck on this subject, saved here: W:\SMART CITIES\1. Secretariat\21. Finalists\Support Measures\2. Finalist Webinars\4. Engagement et Mobilisation (Nov.6).

As part of the consolidation process within Review Teams, reviewers may also consult the opinions rendered by the external technical reviewers once these are available, and as necessary.

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Implementation Phase Requirements

This chapter requires a close look at relevant municipal, provincial, and federal reporting and legislative requirements that would be triggered should the proposal go forward as a winner. SCCD reviewers and other subject matter experts at INFC will determine which of the aforementioned requirements would be triggered and if the plans to address them are reasonable and suitable.

The following four requirements are identified in the Finalist Guide:

1. *Duty to Consult with Indigenous groups and Modern Treaty Obligations*

    - The common law *duty to consult* is based on judicial interpretation of the obligations of the Crown (federal, provincial and territorial governments) in relation to potential or established Aboriginal or Treaty rights of the Indigenous peoples of Canada, recognized and affirmed in section 35 of the Constitution Act, 1982. In Canada, the duty to consult with and accommodate with Indigenous peoples arises when the Crown contemplates actions or decisions that may affect an Indigenous person's Aboriginal or Treaty rights.
    - The Duty to Consult is a constitutional duty that invokes the Honour of the Crown and it must be met. The duty is triggered at a low threshold: all that is required is contemplated Crown conduct resulting in a potential adverse impact to a credible claim.
    - In addition to fulfilling legal obligations to engage with modern treaty holders and self-governing Indigenous groups, finalists may also consult on the basis of the Duty to Consult or as a good governance practice.

    - *Modern Treaties* (also called Land Claim Agreements) are a key component of Canadian nation-building. They advance the shared objective of reconciliation, promote strong and sustainable Indigenous communities, and advance national socio-economic objectives, to the benefit of all Canadians.
    - Treaties are legally binding and constitutionally protected agreements that set out specific rights, benefits and obligations for the signatories.
    - Treaty provisions will vary from treaty to treaty. Treaties and treaty rights also vary depending on the time and circumstances in which they were negotiated.

2. *Community Employment Benefit (CEB)*

    - The Investing in Canada plan (under which the Challenge is funded) encourages project planners and communities across the country to take advantage of their infrastructure projects to support the diversification of recruitment, training, and procurement practices.
    - Detailed CEB guidance can be found here.
    - For the Smart Cities Challenge, finalists are asked to plan and explain how their projects would bring Community Employment Benefits should they become a winner.

3. *Climate Lens Assessment (CLA)*

    - The CLA has been designed as a framework for assessment and reporting for any projects that either:
        (1) deal directly with greenhouse gas mitigation or climate change adaptation, and
        (2) are funded by the program in the amount of $10 million or above.

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- The Investing in Canada plan encourages planners to consider the climate impacts of any project funded under the program. The Climate Lens Assessment (CLA) is intended to provide meaningful insight into the climate impacts of individual projects, and encourage improved choices by project planners consistent with shared federal, provincial, and territorial objectives articulated in the Pan-Canadian Framework for Clean Growth and Climate Change.
- Detailed CLA guidance can be found here.
- Just one finalist (Richmond) meets the requirement to undertake a climate lens assessment.
- If other finalists consider the CLA in their approach, these should be evaluated.
- If the Finalist clearly explains that they undertook the due diligence and concluded that it is not required to develop a Climate lens assessment, they would not be penalized.

4. Other applicable laws, regulations and policies, including any cases of changes or exemption to legislation and regulations that may apply to projects.
   - Finalists should demonstrate the extent to which they explored these possible requirements.
   - In general, the assessment of plans for meeting these requirements should not try to identify all applicable legal considerations. Rather, reviewers are asked to assess whether the proposal demonstrates that sufficient groundwork has been done to prepare for the implementation phase should the finalist be selected as a winner (e.g. has an environmental scan been completed of the project that identifies potential compliance issues and other legal considerations as well as a strategy for addressing them?).
   - This process require some light research on the part of the reviewers to explore whether the planned projects within proposals may be subject to other requirements must be addressed. A document to record other possible requirements has been created and is saved here (Other requirements - Implementation Phase.docx). Reviewers are asked to make note of other applicable requirements for the benefit of other reviewers and the Review Committee.
   - Assessment of this chapter will unfold in two steps:

     Step 1. In consultation with INFC subject matter experts (see below), reviewers should undertake a review of each of the four potential requirements outlined in this chapter and provide a short rationale on whether the proposed approach is relevant and appropriate to meet implementation requirements (~a very short paragraph for each potential requirement).
     - Should a reviewer determine that the proposal refers to or requires regulatory considerations outside of INFC's purview, SCCD may reach out to OGDs to seek clarity or opinions on how well they are addressed. Reviewers should consult with each other and with Eric Poirier in order to consolidate and optimize outreach to OGD experts.
     - If the requirement does not apply, reviewers should describe the requirement as "not applicable" as part of the qualitative rationale section of the evaluation grid.

     Step 2. Once each of the four implementation requirements have been assessed by the subject matter experts, reviewers will finalize their preliminary quantitative summations and finalize a summary short qualitative rationale for the chapter.

Subject Matter Experts. Reviewers are encouraged to seek out further guidance and advice as needed. The following resources are available:

- Duty to Consult and Modern Treaty Obligations:
  i. Eric Poirier
  ii. Matt Baird (SCCD)
  iii. Aboriginal Consultation and Environmental Services (INFC – Program Integration Branch)

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- Climate Lens Assessment (CLA) and Community Economic Benefits (CEB): Policy and Results Branch – Sectoral Policy) Legal Services: If a legal opinion is required, reviewers must first consult with Eric Poirier.

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ANNEX A – ASSESSMENT CRITERIA

Chapter 1: Vision (15 points TOTAL)

Requirements

Finalists were asked to present their smart cities journey, including:

- *How the final proposal carries through the vision laid out in your Challenge Statement and the outcomes in the application, and provides reasonable justification of any variations*
- *How outcomes continue to be:*
  - *reflective of the true needs of the community, as demonstrated through a compelling body of data and evidence and extensive resident engagement*
  - *ambitious and achievable*
  - *meaningful for the community and its residents*
  - *well-suited to a smart cities approach*
  - *measurable*
- *Progress towards outcomes that may have been achieved during the finalist phase*
- *Reasons to be selected as a winner*

Evaluation criteria

Final proposal is driven by the Challenge Statement and carries through the vision laid out in the application: 5 points

5	Exemplary demonstration with no weaknesses ❖ [redacted] ❖
4	Very good demonstration on virtually all aspects, some weaknesses of modest consequence ❖ [redacted] ❖
3	Reasonably good demonstration on most aspects with some weaknesses that need addressing ❖ [redacted] ❖

2	Some good aspects, some questionable/weak demonstrations that need to be addressed ❖ [redacted] ❖
1	Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations ❖ [redacted] ❖
0	No demonstration ❖ [redacted] ❖

Final proposal is transformative, scalable, and replicable within the community and to other communities in Canada: 10 points

10	Exemplary demonstration with no weaknesses ❖ [redacted] ❖
8	Very good demonstration on virtually all aspects, some weaknesses of modest consequence ❖ [redacted] ❖
6	Reasonably good demonstration on most aspects with some weaknesses that need addressing ❖ [redacted] ❖

4	Some good aspects, some questionable/weak demonstrations that need to be addressed ❖ [redacted] ❖
2	Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations ❖ ❖ [redacted]
0	No demonstration ❖ [redacted] ❖

Chapter 6: Engagement - 30 points TOTAL

Requirements

Finalists were instructed to present an engagement plan for the implementation phase, including:

- *Approach to engaging with, gaining acceptance from, and onboarding residents and other stakeholders for projects that ensures ongoing alignment between the outcomes and their concerns and needs*
- *Insights gained through previous engagement processes with residents that shaped the final proposal in a significant way*
- *Tools used in past, planned, and ongoing engagement activities that are adapted to target different population groups and encourage ongoing, high participation*
- *Efforts made to be inclusive and consider the diversity of residents, including the ways in which certain population groups could be positively/negatively and intentionally/unintentionally affected by projects*
- *Experienced or expected reactions from residents and other stakeholders and approaches for managing potential issues*
- *Identification of risks and development of appropriate mitigation strategies*
- *Other details, as required*

Evaluation criteria

Engagement to date and plans to engage residents and other stakeholders in the implementation phase are detailed, complete, inclusive, meaningful, and well-suited to achieve the outcomes: 10 points

10	Exemplary demonstration with no weaknesses ❖ [redacted] ❖
8	Very good demonstration on virtually all aspects, some weaknesses of modest consequence ❖ [redacted] ❖
6	Reasonably good demonstration on most aspects with some weaknesses that need addressing ❖ [redacted] ❖
4	Some good aspects, some questionable/weak demonstrations that need to be addressed ❖ [redacted] ❖
2	Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations ❖ [redacted] ❖
0	No demonstration ❖ [redacted] ❖

Plan supports the implementation of projects: 5 points

5	Exemplary demonstration with no weaknesses ❖ [redacted] ❖
4	Very good demonstration on virtually all aspects, some weaknesses of modest consequence ❖ [redacted] ❖
3	Reasonably good demonstration on most aspects with some weaknesses that need addressing ❖ [redacted] ❖
2	Some good aspects, some questionable/weak demonstrations that need to be addressed ❖ [redacted] ❖
1	Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations ❖ [redacted] ❖
0	No demonstration ❖ [redacted] ❖

Diversity and inclusion are reflected in project design, and facilitate the implementation of projects: 10 points

10	Exemplary demonstration with no weaknesses ❖ [redacted] ❖
8	Very good demonstration on virtually all aspects, some weaknesses of modest consequence ❖ [redacted] ❖
6	Reasonably good demonstration on most aspects with some weaknesses that need addressing ❖ [redacted] ❖
4	Some good aspects, some questionable/weak demonstrations that need to be addressed ❖ [redacted] ❖
2	Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations ❖ [redacted] ❖
0	No demonstration ❖ [redacted] ❖

Risk strategy is thorough and adequately addresses key risks: 5 points

5	Exemplary demonstration with no weaknesses ❖ [redacted] ❖
4	Very good demonstration on virtually all aspects, some weaknesses of modest consequence ❖ [redacted] ❖
3	Reasonably good demonstration on most aspects with some weaknesses that need addressing ❖ [redacted] ❖
2	Some good aspects, some questionable/weak demonstrations that need to be addressed ❖ [redacted] ❖
1	Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations ❖ [redacted] ❖
0	No demonstration ❖ [redacted] ❖

Chapter 9: Implementation Phase Requirements - 10 points TOTAL

Requirements

This chapter requires finalists to identify and provide the plans for meeting applicable municipal, provincial, and federal reporting and legislative and policy requirements should you be selected as a

Evaluation criteria

Plans for meeting relevant municipal, provincial, and federal reporting and legislative requirements are provided and serve as sufficient groundwork for the implementation phase should the finalist be selected as a winner[1]: 5 points

5	Exemplary demonstration with no weaknesses ❖ [redacted] ❖
4	Very good demonstration on virtually all aspects, some weaknesses of modest consequence ❖ [redacted] ❖
3	Reasonably good demonstration on most aspects with some weaknesses that need addressing ❖ [redacted] ❖
2	Some good aspects, some questionable/weak demonstrations that need to be addressed ❖ [redacted]

[1] Note that SCCD staff are not legal experts. As possible, and by employing a risk-based approach to the review process, SCCD will endeavour to identify applicable laws, regulations, etc. pertinent to the final proposals. However, given the breadth of subject matter contained in the proposals, it may not be possible to fully determine the applicability of all relevant elements.

	❖ [redacted]
1	Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations ❖ [redacted] ❖
0	No demonstration ❖ [redacted] ❖

Risk strategy is thorough and adequately addresses key risks: 5 points

5	Exemplary demonstration with no weaknesses ❖ [redacted] ❖
4	Very good demonstration on virtually all aspects, some weaknesses of modest consequence ❖ [redacted] ❖
3	Reasonably good demonstration on most aspects with some weaknesses that need addressing ❖ [redacted] ❖
2	Some good aspects, some questionable/weak demonstrations that need to be addressed ❖ [redacted] ❖
1	Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations ❖ [redacted]

	❖ [redacted]
0	No demonstration ❖ [redacted] ❖

Program - Assessment Hashing Date Mar. 12/19

- should review all proposals to help a future discussion

- Notes re: cross referencing across proposal
- note issues that may not be realistic or won't be rolled out in program plan

- wholistic → follow the trail

DTC,
CEB, CLA → based on webinar info.
step 1.
step 2 - go to policy experts @ INFC

- daily touch base

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Standing

Briefing -

Date

ATIA - 21(1)(b)

[redacted]

TASK: JOLE

4/5

→ lack of risk strategy in 5 million dollar category

→ Federation Grant use? where is it?

→

→ extract from and save into finished Folder

label: "AKwasasne

Print printer:

---

infrastructure

circular economy

circular revenue

Program Standing March 18 9:45

- RGCT is pending in their assessment of Edmonton Treasured - know the proposal before then.

- Central Collab use? ask Evelynne or Susan

Grand ✓
p. 1 & 76
C 80

Namaint Par
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Richmond Fyde
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Eastmain [redacted] Sask
t, 63

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ATIA - 19(1)

Bouchard, Kathleen (INFC)

From: Seto, David [redacted]
Sent: March 18, 2019 12:39 PM
To: Bouchard, Kathleen (INFC)
Cc: Baird, Matthew (INFC); Ahmar, Karim
Subject: INFC | Smart Cities Challenge - Finalist Proposals Evaluation Status Report for teh Period Ending March 15th, 2019
Attachments: Weekly Status Report - March 15 2019.pdf

Hi Kathleen,

Please find attached the Status Report for the Week Ending March 15th, 2019.

Please let us know if you have any questions or comments.

Kindest Regards,

David

David Seto | Senior Director, Advisory Services
Raymond Chabot Grant Thornton
Direct Line [redacted] | Mobile [redacted]
116 Albert Street, Suite 1000, Ottawa, ON K1P 5G3



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Infrastructure Canada Weekly Status Report			
Project Name	Smart Cities Challenge - Finalist Proposals Evaluation		
Date	03/18/2019	**Reporting Period**	03/04/2019 to 03/15/2019

Distribution List:			
Project Authority	**Kathleen Bouchard** **Jenny Tremblay** **Matthew Baird**	**RCGT Project Lead**	**David Seto**

1. Overall Project Status

Scope	Completed adjustments to the Methodology and Project Plan, and Project Charter inclusive of the composition of project teams. Assessment Report #1 (D4A) for [redacted] is in progress. SME review of remaining 19 proposals ongoing.
Budget	See Appendix A of status report for budget details.
Schedule	Project on schedule.

2. Major Milestones/Deliverables Performance

Milestone / Deliverable	Planned Completion Date	Date Approved by Project Authority	Status (See Legend Below)
Introductory Meeting (D1A)	02/07/2019	02/07/2019	Completed
Preparatory Work (D1B)	03/06/2019	03/06/2019	Completed
Methodology and Project Plan (D2A)	03/01/2019	03/08/2019	Completed
As required: adjustments to the Methodology and Project Plan (D2B)	03/12/2019	03/12/2019	Completed
Assessment Report #1 (D4A)	03/22/2019		In progress
Assessment Reports #2 to #20 (D4B –D4T)	04/08/2019		In progress

- GREEN – On target to achieve Planned Delivery Date.
- AMBER – Planned Target Delivery Date is in danger of not being achieved but a managed solution capable of bringing forward the actual delivery date is being applied.
- RED – Planned Target Delivery Date is not going to be achieved or has already passed. No work rounds or solutions capable

2. Major Milestones/Deliverables Performance			
Milestone / Deliverable	**Planned Completion Date**	**Date Approved by Project Authority**	**Status (See Legend Below)**
of bringing forward the planned dates are available.			

3. Activities & Risks/Issue Monitoring	
Activity Description	**Date of Completion**
Key Activities Completed over the Reporting Period	
Review of Preparatory Work	03/06/2019
Delivery and Acceptance of Project Charter	03/08/2019
Delivery and acceptance of Project Plan	03/08/2019
Key Activities Planned for Next Reporting Period	
Draft Assessment Report #1 [redacted]	03/19/2019
Final Draft Assessment Report #1 [redacted]	03/22/2019
Assessment Report #2 - #20	Ongoing

Risks/Issue Management

No.	Risk/Issue Description	Mitigation Strategy	Date Approved by Project Authority
1	Resource availability	RCGT will engage an equally qualified resource from the pool of experts from our national network of resources	02/06/2019
2	Conflicts of Interest	RCGT has already completed Conflict Checks for each of the proposed team members. If additional resources are required, Conflict Checks will be completed prior to any participation in the project. Nationwide Conflict Check underway to identify any potential conflicts of interest between the 20 Finalists and any of our other offices.	02/06/2019

Appendix A

Budget reporting – work completed versus budget spent to date, as at 3/15/2019.

Total Fees (Budget)	Fees Incurred to Date	Travel
$280,500	[redacted]	$0

ATIA - 21(1)(b)

Beute, Shantel (INFC)

From: Baird, Matthew (INFC)
Sent: March 18, 2019 3:42 PM
To: Beute, Shantel (INFC)
Subject: Re: Weekly Standing notes

Thanks for this. Very informative!

Sent from my iPhone

On Mar 18, 2019, at 2:40 PM, Beute, Shantel (INFC) <shantel.beute@canada.ca> wrote:

Hi Matt,

Some points of info from standing meeting thought you might find interesting:

- The Federal Budget it coming out tomorrow. [redacted]
- Chair of the Jury had good things to say in his call with Jenny this morning. He confirmed that they feel independent and are very happy with our team's support. [redacted]
- [redacted]
- [redacted] seeing as it is difficult to collect data on outcomes without help.
- Jury deliberations will be held at Novatel and Chateau Laurier.
- We received back the executive summaries that had to be translated.
- Start thinking about how finalists from round 1 can be 'ambassadors' for future rounds.
- Noting that perspectives from within the team will differ on the evaluations given several helped write the applicant guide and completed site visits and others did not. This suggests that the perspective of those who have not been part of those processes may have a similar perspective as the Jury.

Best,
Shantel

Shantel Beute
Smart Cities Challenge Directorate | Direction du Défi des villes intelligentes
Infrastructure Canada | Government of Canada
Shantel.Beute@canada.ca | Tel: 613-946-8669

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Page 206
is withheld
pursuant to paragraph
21(1)(b)
of the *Access to Information Act*

****

La page 206
Font l'objet d'une exception totale
conformément aux dispositions de paragraphe
21(1)(b)
de la *loi sur l'accès à l'information*

ATIA - 21(1)(b)

Task : PIA Analysis

Date March 22, 2019.

[redacted]

Final initial

① [redacted]

②

③

François

Page

ATIA - 21(1)(b)

ATIA - 19(1)

TASKS

Date March 26, 2019

☐ Privacy commissioner analysis + PPIA analysis

- Not everyone provided evidence of collaboration w/ PC. [redacted]
  - ↳ Unclear of PC feedback + [redacted]
- [redacted]
- emailed Alex asking for meeting
- [redacted]
- ☆ finalist changed URLs of proposals. ← let Susan know if can change in future. / other documents [redacted]

Meeting to discuss PPIA + Privacy Analysis March 27, 2019

[redacted]

- ☆ appendices, letters of support ☆ Search: Privacy Commissioner
- Trend - What is the key issues overall? How are they addressed? Flags / gaps
- Flag PC → submit PPIA → PC gives feedback + validation ☆
- [redacted]

Page

ATIA - 21(1)(b)

Date April 1, 2019

Tasks

- ☐ Privacy chapter + PPIA analysis
- ☐ Check if outreach #'s + interests are properly recorded.
- [redacted]
- ☐ Outreach folder - organization

April 1 *
- ~~Côte Saint-Luc~~
- ~~Saint Mary's - Fredericton~~

April 2
- ~~Parkland~~ ← [redacted]
- ~~Airdrie~~
- ~~Richmond~~

April 3
- ~~Guelph~~
- ~~Saskatoon~~
- ~~Victoria~~
- ~~Waterloo~~

April 4
- QC
- Edmonton
- Montreal
- Surrey - Vancouver

April 5
- TRENDS

Page

ATIA - 19(1)
ATIA - 21(1)(b)

Baird, Matthew (INFC)

From: Baird, Matthew (INFC)
Sent: March 22, 2019 12:43 PM
To: Eric Poirier2 (INFC) (eric.poirier2@canada.ca); Jenny Tremblay (INFC) (jenny.tremblay@canada.ca)
Cc: Fletcher-Kyle, Ashley (INFC); Cardinal2, Patrick (INFC)
Subject: FW: INFC | Smart Cities Challenge Finalist Proposal Evaluation - [redacted]

From: Baird, Matthew (INFC)
Sent: March 22, 2019 12:41 PM
To: 'Seto, David' [redacted] Bouchard, Kathleen (INFC) <kathleen.bouchard@canada.ca>
Subject: RE: INFC | Smart Cities Challenge Finalist Proposal Evaluation - [redacted]

Hi David,

Thank you for providing us with an example case of your preliminary assessment for our review of your general assessment approach and report design. We are providing the following feedback:

General – We really like the work performed and the approach. For the most part the assessment report's structure, length, depth and tone is appropriate and well-balanced. We particularly like the assessment summary table at the end which we feel will be a useful reference for the Jury to use during their evaluation process.

We do recommend a change to the layout of the document sections such that the sections containing the boiler plate wording (i.e. Section 1 limitations and Section 2 objective, scope and methodology etc.) be combined together into its own section. This section should appear either at the very front or the very end instead of in between the executive summary and proposal overview.

[redacted]

Please spell out all acronyms (e.g. ABC costing – Activity Based Costing) as not all jury members will be familiar with these technical terms. Also noted was an inconsistency in the use/non-use of contractions.

Proposal Overview - [redacted]

Performance Measurement - [redacted]

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[redacted]

Data and Privacy - [redacted]

We expect that there will be a review of all of the assessments and recalibration in order to ensure that the assessment criteria were applied in a consistent fashion. [redacted]

Let me know if you wish to discuss. We would also like to hear from you whether you had any feedback from your team of assessors/SMEs with respect to the clarity of the assessment criteria.

Matt

Matthew Baird

Principal Analyst,
Smart Cities Challenge Directorate
Infrastructure Canada / Government of Canada
matthew.baird@canada.ca / Tel: 819-639-8369

Analyst principal,
Direction du défi des villes intelligentes
Infrastructure Canada / Gouvernement du Canada
matthew.baird@canada.ca / Tél. : 819-639-8369

From: Seto, David [redacted]
Sent: March 19, 2019 3:05 PM
To: Bouchard, Kathleen (INFC) <kathleen.bouchard@canada.ca>; Baird, Matthew (INFC) <matthew.baird@canada.ca>
Subject: INFC | Smart Cities Challenge Finalist Proposal Evaluation [redacted]

Hi Kathleen & Matthew,

Please find attached the Draft Assessment Report [redacted]

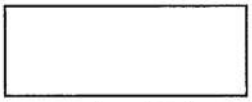
Please review and let me know if you have any questions or comments.

Kindest Regards,

David

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David Seto | Senior Director, Advisory Services
Raymond Chabot Grant Thornton
Direct Line [redacted] | Mobile [redacted]
116 Albert Street, Suite 1000, Ottawa, ON K1P 5G3



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ATIA - 19(1)

ATIA - 21(1)(b)

Poirier2, Eric (INFC)

From: Long, Alexander (INFC)
Sent: March 22, 2019 11:08 AM
To: Poirier2, Eric (INFC)
Cc: Hwang, Susan (INFC)
Subject: CLA for Richmond - Review by INFC Colleagues
Attachments: Smart Cities Challenge - Webinar Presentation - 28Aug2018 (EN).ppt; Richmond Final Proposal - Implementation Phase Requirements.pdf

Follow Up Flag: Flag for follow up
Flag Status: Flagged

Hi Eric,

As discussed yesterday, Richmond is the only finalist required to do a full CLA. Attached is the Implementation Phase chapter from Richmond's proposal which outlines their CLA approach. Also attached is the original presentation to finalists which provided INFC's guidance (from Robert Judge's team) on the CLA requirements. The relevant slides are 8-12. Could you send this on to Tushara to make sure it responds to their understanding of what they asked for?

[redacted]

Alex

Alex Long
Senior Advisor | Conseiller principal
Smart Cities Challenge | Défi des villes intelligentes
Infrastructure Canada
Alexander.Long@canada.ca | T : 613-957-7304 | M : 613-302-9222

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Canada

SMART CITIES CHALLENGE

Finalist Webinar #2:

Implementation Phase Requirements

August 28, 2018

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AGENDA

- Overview
- Community Employment Benefits (CEB)
- Climate Lens Assessment (CLA)
- Duty to Consult and Modern Treaty obligations
- Other applicable laws, regulations and policies
- Communications touch base
- Next steps

Community Employment Benefits (CEB)

COMMUNITY EMPLOYMENT BENEFIT (CEB)

- Encourage communities to diversify recruitment, training and procurement practices
- Gather data on best practices across Canada, highlighting opportunities and challenges faced by construction industry and related sectors
- Results will be reported annually over the course of the project

http://www.infrastructure.gc.ca/pub/other-autre/ceb-ace-eng.html

TARGETED GROUPS

- Groups targeted by the CEB initiative include:
    - Indigenous peoples
    - Women
    - Youth
    - People with disabilities
    - Veterans
    - Recent Immigrants
    - Apprentices
    - Small and Medium Enterprises
    - Social Enterprises

NEXT STEPS FOR FINALISTS

- If selected as a winner, what are your plans for:
  - Identifying target groups that would benefit from your projects as well as goals for each group
  - Reporting on the CEB, including submission timelines
  - Collecting, managing, and tracking the required data
- Remember to reflect these plans in relevant chapters of your final proposal (e.g. project management, engagement, data and privacy, financial)

Q&A

Submit questions using the chat function

Climate Lens Assessment (CLA)

ABOUT THE CLIMATE LENS

- Assess expected greenhouse gas (GHG) emissions and/or resilience to the impacts of climate change
- Applies to winners whose projects have a total value of more than $10 million and have either a climate change adaptation or mitigation focus

http://www.infrastructure.gc.ca/pub/other-autre/cl-occ-eng.html

GREENHOUSE GAS MITIGATION ASSESSMENT

- Measure a project's anticipated GHG emissions impact
- Scope includes direct and significant indirect effects (emissions and reductions)
- Timeline includes construction, operations, and maintenance over the asset's expected life
- [Project Emissions] – [Baseline Emissions] = [Overall Emissions]

CLIMATE CHANGE RESILIENCE ASSESSMENT

- Analysis of future climate conditions and risk treatment
- Plans to projects resilient to future climate conditions and impacts
- Attestation by qualified party

NEXT STEPS FOR FINALISTS

- *If the CLA pertains to you*, and if selected as a winner, what are your plans for:
  - Conducting the CLA, submission timelines, and who would complete/attest to it
  - How much it would cost
  - Collecting, managing, and tracking the required data
- Remember to reflect these plans in relevant chapters of your final proposal (e.g. project management, engagement, data and privacy, financial)
- *If the CLA does not pertain to you*, state that the total cost of projects with a primary focus on climate change adaptation, resilience, disaster mitigation, or a reduction in GHG emissions is less than $10 million

Q&A

Submit questions using the "chat" function

Other applicable laws, regulations and policies

Duty to Consult and Modern Treaty obligations

FINALIST CONSIDERATIONS

- The Finalist Guide lists the Duty to Consult and Modern Treaties as implementation requirements to consider
- These are listed in order to raise awareness and ensure that Finalists take the time to consider whether these may be triggered in the context of their proposal
- Regardless, in the spirit of Reconciliation, we encourage you to engage with any Indigenous peoples in your community
- Indigenous peoples will bring new perspectives, expertise, and interests to your project that you may not have considered

Q&A

Submit questions using the "chat" function

Communications touch-base

NEXT STEPS

- Next webinar: Sept 11, 12:30 p.m. EST
- Reminder: sign and return grant agreements
- Site visit: discuss with Primary Contact potential dates and activities
- Finalist Fall forum: early November (exact date TBD)

IMPLEMENTATION PHASE REQUIREMENTS

Our Smart Cities projects have been planned to address our various requirements and commitments to our residents and other stakeholders. This includes our commitments to meet applicable municipal, provincial, and federal reporting and legislative and policy requirements.

9.1 INDIGENOUS ENGAGEMENT

We recognize the importance of good faith engagement and understand the legal duty to consult for the Provincial and Federal Governments may be triggered by any Crown conduct that may adversely impact any potential or established Aboriginal or Treaty rights. We have established relationships with neighbouring First Nations. These include the Musqueam Indian Band, Tsawwassen First Nation, and Squamish First Nation.

Our engagement procedures support the federal and provincial guidelines, including the federal Aboriginal Consultation and Accommodation – updated Guidelines for Federal Officials to Fulfill the Duty to Consult (March 2011) and the provincial guidelines, Updated Procedures for Meeting Legal Obligations when Consulting with First Nations (May 2012).

The City of Richmond has a long-term relationship with the Musqueam Indian Band. Musqueam representatives have participated on the Advisory Committee for the Smart Cities Challenge. We intend to collaborate to develop technology solutions that can help the Musqueam people as they see fit. By their participation as a member of our Advisory Committee, we want to ensure that the needs and interests of their community are addressed as we move to the implementation phase of the Smart Cities projects.

We have reached out to all three First Nations to begin dialogue on our Smart Cities Challenge program.

9.2 COMMUNITY EMPLOYMENT BENEFIT (CEB)

Richmond is a vibrant, rapidly developing city with a strong economy that has attracted thousands of its residents from around the world. Our population has the highest proportion of immigrants of any city in Canada. 74% of our population originates from Asia-Pacific countries with at least 54% speaking a language other than English or French at home. The City recognizes the importance of reflecting this cultural diversity in our workforce in order to effectively serve the diverse needs of the community, through the award winning Human Resources program for people with disabilities.

To support our commitment to workplace diversity, the City of Richmond offers a variety of intercultural awareness training initiatives to increase the level of employee awareness and understanding within the workforce. We employ two full-time diversity coordinators and we are working to incorporate diversity and cultural awareness as part of our Respectful Workplace Policy. Richmond also provides a new immigrant welcome package, in multiple languages, to help new residents tap into the wide range of support services offered.

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9.2 COMMUNITY EMPLOYMENT BENEFIT (CEB)

Promotion of diversity is demonstrated through:

- Applying different problem solving skills towards a common goal
- Building relationships with different community groups
- Embracing diverse perspectives and approaches that foster innovation
- Guiding decision making and planning through inclusion, cooperation, dynamism, integration, and equality
- Providing equal opportunity in all areas of our work
- Implementing systems and procedures that consider individual differences in all aspects of our service and planning delivery

We are committed to participate in Infrastructure Canada's Community Employment Benefits Initiative. We already have a strong commitment to workplace diversity and are dedicated to continue our diversity strategy with our Smart Cities Projects. We will continue to provide employment and/or procurement opportunities to the groups targeted by the CEB initiative including apprentices; Indigenous peoples; women; persons with disabilities; veterans; youth; recent immigrants; and small-sized, medium-sized and social enterprises. We will establish specific targets for our projects, allowing for flexibility to consider various factors such as complementing our existing employment initiatives and our local labour market dynamics.

9.3 REPORTING

We will provide Infrastructure Canada with our benefit targets for the federal target groups listed above. This will be completed as soon as possible after the Challenge award outcome. We will report annually on our progress against the targets for each project which will include the number of hours worked by a target population and/or the value of contracts provided to target groups. We will identify key successes as well as any challenges in attempting to meet the project targets. We have assigned a dedicated resource who will collect, manage and track the required data to report against our targets.

9.4 CLIMATE LENS ASSESSMENT

The City of Richmond has a strong commitment to addressing and mitigating climate change. The City has achieved carbon neutral status annually since 2013 and anticipates maintaining that status for the foreseeable future. From 2007 to 2015, the City reduced Greenhouse Gas emissions by 12%, despite a population growth of 12% in the same period.

We are committed to undertaking a comprehensive Climate Lens Assessment to provide meaningful insight into the climate impacts of individual projects and to ensure consistency with shared federal, provincial and territorial objectives articulated in the Pan-Canadian Framework for Clean Growth and Climate Change.

As our project has both climate change mitigation and climate change adaptation, resilience and disaster mitigation elements, we will conduct both requirements under the Climate Lens Assessment: the GHG Mitigation Assessment and the Climate Change Resilience Assessment.

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9.4.1 GREENHOUSE GAS MITIGATION ASSESSMENT

We will procure a qualified assessor (i.e., a professional engineer or GHG Accounting Professional) to conduct the assessment who will provide an attestation confirming that the assessment conforms to the guidance provided by Infrastructure Canada and aligns with the relevant assessment standard. Our Mitigation Assessments will consider the same greenhouse gases tracked through Canada's National Inventory Report and will include all direct and all significant indirect emissions. We will assess each project across the construction and operations and maintenance phases, and will include estimates of a project's cumulative construction and operations and maintenance emissions over the useful lifespan of the infrastructure.

Our Assessment will include the following components:

- Baseline GHG Emissions Calculations
- Estimate GHG Emissions of Assets
- Net increase / reduction in GHG emissions
- Cost-per-tonne calculations
- Identification of GHG mitigation opportunities

9.4.2 CLIMATE CHANGE RESILIENCE ASSESSMENT

We will procure a qualified assessor (i.e., a professional engineer or GHG Accounting Professional) to conduct the assessment to identify, evaluate and manage risks, resulting in reducing the risk to an acceptable level by enhancing the resilience or adaptability of assets or systems to climate change impacts. They will provide an attestation confirming that the assessment conforms to Infrastructure Canada's Climate Lens Guidance.

The assessment will support more informed decision-making during an infrastructure project's planning and design stages and it will therefore consider the full range of project design choices being made (i.e., location, materials used, construction methods/standards etc.). It will also consider the climate risks during construction and planned operation and maintenance phases and will include asset-specific resilience solutions as well as identify potential upstream and downstream impacts of the proposed solutions within the broader environment. The timescale of our assessment will match the intended lifespan of the asset.

Our assessment will include identification and assessment of climate change risks. Risk will be assessed using the following order and naming convention:

- Climate change hazard
- Impact on asset
- Consequence of impact

9.4.3 ANALYSIS OF RISK, CONSEQUENCES, LIKELIHOOD, AND VULNERABILITY

After identifying and assessing each risk we will conduct an analysis to identify the magnitude of the consequence of an event and its likelihood of occurring. This will be considered in the context of the climate change scenarios being evaluated and the existing controls to manage the risk.

Please find a completed Climate Lens for GHG Change Resilience Assessment from a recent previous project in Appendix 9.1.

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9.5 RESILIENCE MEASURES

We will identify which resilience measures have been analyzed and implemented, including the projected change in resilience as a result. We will also justify why particular risks are not being mitigated against and identify any anticipated residual risk flowing mitigation measures (if any). Where possible we will calculate the return on investment of the projects through a Loss Estimation Analysis and a Return on Mitigation Investment calculation.

9.6 OTHER APPLICABLE LAWS, REGULATIONS, AND POLICIES

We have completed a full review of any applicable laws, regulations and policies and have dedicated resources to ensure that our Smart Cities projects meet all requirements under them. We have identified the following applicable laws, regulations and policies:

- Freedom of Information and Protection of Privacy Act
- Local Government Act
- Fire Safety Act (Bill 4)
- Occupational Health and Safety Regulation
- Safety Authority Act
- Safety Standards Act
- Workers Compensation Act
- Environmental Assessment Act
- Information Management Regulation

9.7 RISKS AND MITIGATION

Table 9.7 Implementation Phase Risks and Mitigation

RISK	DESCRIPTION	MITIGATION
Requirements and commitments are not well understood	Projects proceed without knowledge or understanding of commitments and requirements.	Project plans incorporate legislative requirements and other commitments that inform planning, tracking, reporting and implementation impacts.
Non-compliance to commitments made and requirements	As project activities progress, commitments and legislative requirements are missed.	Strong project governance processes that include a compliance log and reporting that specifically track progress against commitments and requirements.
Lack of baseline data and data collection	Baseline data is incomplete or inaccurate and/or data collection against baseline is insufficient or flawed.	Baseline data is approved through the project governance structure and data collection processes are identified, checked and included in project plans and execution documents.

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BRIEFING NOTE TO THE DEPUTY MINISTER

SMART CITIES CHALLENGE FINAL PROPOSAL EVALUATION/REVIEW PROCESS

(For Information)

PURPOSE

- This note provides an overview of the evaluation/review process for the Smart Cities Challenge final proposals (**Annexes A and B**), and outlines considerations and next steps as we move toward the selection of winners and their announcement on May 14, 2019.

HIGHLIGHTS/KEY CONSIDERATIONS

- All final proposals (20) were received on March 5, 2019. To ensure appropriate support to the Smart Cities Challenge Jury, the Smart Cities Challenge Directorate is coordinating technical reviews of these proposals. On parallel tracks, in-depth technical reviews are being undertaken by a contracted external firm (Raymond Chabot Grant Thornton) as well as by the Smart Cities Challenge Directorate in consultation with experts within Infrastructure Canada (INFC) and from other government departments, as required.

- These reviews will result in the creation of support packages for the independent Jury, who will meet to deliberate on two occasions (April 23-24 and May 2-3, 2019) to produce, through consensus, a recommended slate of winners for consideration by the Minister. The purpose of INFC's internal and external review process is not to fully evaluate or rank the merit of the final proposals. The purpose is to provide the Jury and ultimately the Minister with comprehensive and considered summaries of the key strengths and weaknesses of the submissions so that they may take this information into account during their deliberations.

- It is hoped that the Minister could meet with the Jury during one of these deliberation days to thank the members for their service and present them each with an acknowledgement gift.

- The Jury's task is to consider each final proposal against the evaluation criteria published in the Finalist Guide (**Annex C**). At the end of the process, the Jury will reach a consensus score for each of the final proposals. Each finalist will be provided their score in private.

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- Following the delivery of the recommended slate of winners by the Jury (expected on or shortly after May 3), the department will seek the decision of the Minister through a decision note. Given the timing of the announcement event (May 14, 2019), a quick decision will be required. [redacted]

NEXT STEPS

- The Smart Cities Challenge Directorate's internal and external review process, as well as overall planning and support for the Jury and its deliberations will continue until early May.

- Planning continues for the May 14 finalist showcase and announcement event to be held at the National Arts Centre.

[redacted]

MAR 2 2 2019

Gerard Peets
Assistant Deputy Minister
Policy and Results

Date

Attachments:

Annex A: Final Proposals Review and Evaluation Process at a Glance
Annex B: Timeline
Annex C: Consolidated Evaluation Criteria (Finalist Guide)

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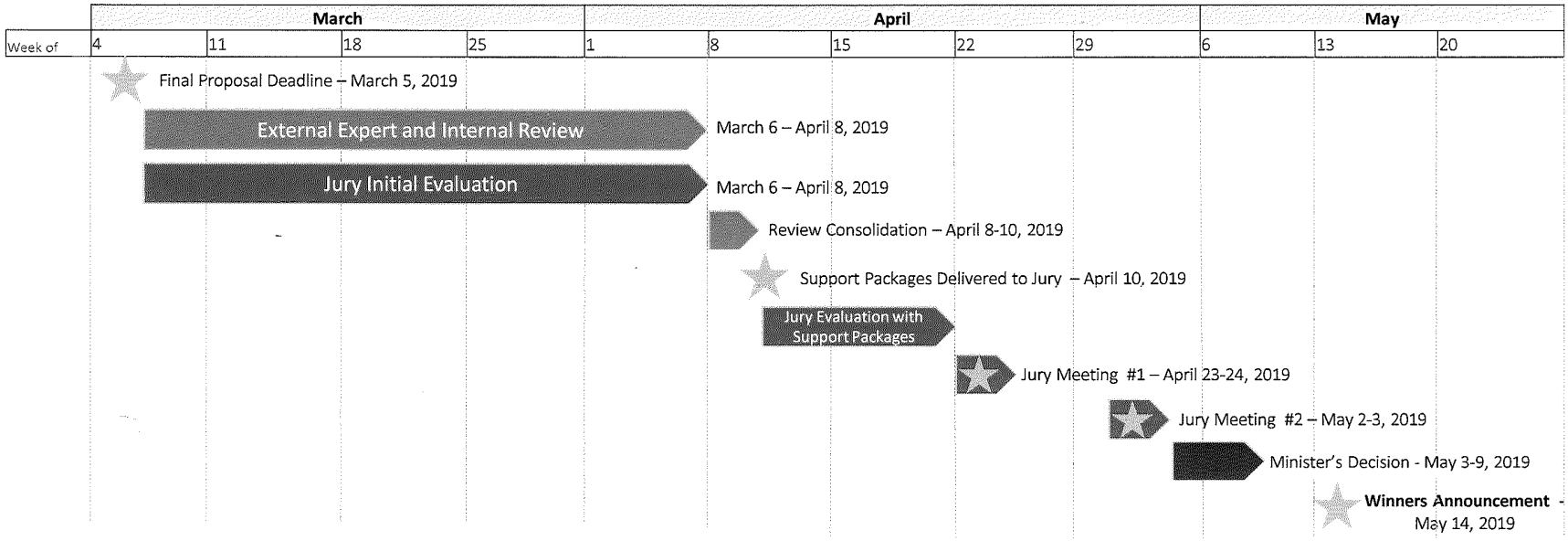
Steps	**Key Activities**	**Dates**	**Resources**
The Smart Cities Challenge email/file sharing system application intake closed on March 5th at 11:59 p.m. PST.			
Completeness Screening	***The Smart Cities team conducts a completeness screen, confirming that finalists have submitted all required components of the final proposal*** 1. Completeness checks completed for each final proposal	▪ March 6: Completeness checks completed ▪ March 6: French-language applications sent to translation	▪ INFC Smart Cities team
Preparation for Expert Review and Web Posting	***Final proposals are prepared for internal/external expert review as well as content for posting on the INFC website via the IICP and Smart Cities Challenge online interactive maps*** 1. French-language submissions sent for English translation 2. English-language executive summaries sent for French translation 3. Executive Summaries posted to interactive online maps in both official languages with links to full final proposals and video on finalist website	▪ March 6-8: processing and sending for translation ▪ March 22: target for finalised translations ▪ As soon as possible thereafter: Executive Summaries posted to interactive online maps in both official languages and links	▪ INFC Smart Cities team ▪ INFC IM/IT team ▪ INFC Communications ▪ Translation services
Internal and External Expert Review	***On parallel tracks, reviews of final proposals are undertaken by internal and external experts to create support packages for the Jury:*** • External review: Expert technical reviews are prepared by contracted external firm (Raymond Chabot Grant Thornton (RCGT)) for *Performance Measurement, Project Management, Technology, Governance, Data and Privacy* and *Financial* chapters of the final proposals. • Internal review: *Vision, Engagement* and *Implementation Phase Requirements* chapters are reviewed by the INFC Smart Cities team in consultation with INFC subject matter experts and other government departments (OGDs), if required. 1. Reviews of final proposals are consolidated to produce Jury support packages 2. INFC Smart Cities Review Committee and senior management approve final Jury packages 3. Jury support packages are delivered to the Jury	▪ March 8-April 8: Internal review process ▪ March 6-April 8: External expert review process o March 23: External experts submit interim report and preliminary reviews o April 8: Final report and final reviews received from external experts ▪ April 8-10: Reviews are consolidated and approved ▪ April 10: Review packages provided to Jury	▪ Review Teams from INFC Smart Cities team ($5M, $10 and $50M categories) ▪ Review Committee from INFC Smart Cities staff and management ▪ INFC experts in subject matter domains ▪ Subject matter experts from other government departments ▪ External experts (RCGT)
Jury Evaluation and Deliberation	***The independent Jury evaluates final proposals and deliberates to recommend four winners to the Minister of Infrastructure and Communities*** 1. Jury members evaluate all final proposals using evaluation grids (criteria) 2. Jury members have the opportunity to work collaboratively in assigned working groups prior to in-person deliberations 3. Jury members meet in personon two occasions to deliberate and finalize a potential slate of winners	▪ March 6: Jury receives access to all final proposals ▪ April 10: Jury receives Jury support packages ▪ April 23-24: Jury meets in Ottawa to deliberate ▪ May 2-3: Jury meets in Ottawa to deliberate and recommend slate of winners	▪ Jury Members including Jury Chair ▪ Support INFC Smart Cities team on meeting logistics and coordination
Recommendation and consideration by Minister	***Jury members recommend a slate of potential winners to the Minister of Infrastructure and Communities for approval*** 1. Minister of Infrastructure reviews slate of winners 2. [redacted] 3. Minister approves slate of winners	▪ May 3: Minister receives slate of winners ▪ May 3-8: Minister's consideration [redacted] ▪ May 9: Minister approves slate of winners	▪ Jury Chair ▪ Jury Secretariat ▪ Deputy Minister ▪ Minister's Office ▪ Minister

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Annex A

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TIMELINE

REVIEW AND EVALUATION OF SMART CITIES CHALLENGE FINAL PROPOSALS – COMPETITION 1



DRAFT for DISCUSSION

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APPENDIX 4: CONSOLIDATED REQUIREMENTS & EVALUATION CRITERIA

EXECUTIVE SUMMARY

REQUIREMENTS

Provide an executive summary of your final proposal, including:

- Reiteration of the Challenge Statement
- Overview of the upcoming nine chapters

EVALUATION CRITERIA

N/A

RUBRIC

N/A

CHAPTER 1: VISION

✓ **15 POINTS TOTAL**

REQUIREMENTS

Present your smart cities journey, including:

- How your final proposal carries through the vision laid out in your Challenge Statement and the outcomes in your application, and provides reasonable justification of any variations
- How your outcomes continue to be:
  - reflective of the true needs of the community, as demonstrated through a compelling body of data and evidence and extensive resident engagement
  - ambitious and achievable
  - meaningful for the community and its residents
  - well-suited to a smart cities approach
  - measurable
- Progress towards outcomes that may have been achieved during the finalist phase
- Reasons to be selected as a winner

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EVALUATION CRITERIA

Final proposal is driven by the Challenge Statement and carries through the vision laid out in the application:

✓ **5 POINTS**

RUBRIC	
5	Exemplary demonstration with no weaknesses
4	Very good demonstration on virtually all aspects, some weaknesses of modest consequence
3	Reasonably good demonstration on most aspects with some weaknesses that need addressing
2	Some good aspects, some questionable/weak demonstrations that need to be addressed
1	Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
0	No demonstration

Final proposal is transformative, scalable, and replicable within the community and to other communities in Canada:

✓ **10 POINTS**

RUBRIC	
10	Exemplary demonstration with no weaknesses
8	Very good demonstration on virtually all aspects, some weaknesses of modest consequence
6	Reasonably good demonstration on most aspects with some weaknesses that need addressing
4	Some good aspects, some questionable/weak demonstrations that need to be addressed
2	Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
0	No demonstration

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CHAPTER 2: PERFORMANCE MEASUREMENT

✓ 25 POINTS TOTAL

REQUIREMENTS

Provide an outcomes-based performance measurement plan for the implementation phase, including:

- Project activities and their links to outputs and outcomes
- Project timelines, deliverables, and milestones that are ambitious yet attainable
- Payment schedule with amounts that are reasonable and rational in the context of project timelines, deliverables, milestones, and prize category
- Qualitative and quantitative performance indicators and related data sources that are meaningful and can measure short, medium, and long-term progress towards outcomes
- Monitoring, reporting, and evaluation strategies and checkpoints for contingencies and course corrections, if necessary
- Identification of risks and development of appropriate mitigation strategies
- Other details, as required

EVALUATION CRITERIA

Plan is detailed, complete, feasible, and well-suited to achieve the outcomes

✓ 10 POINTS

RUBRIC	
10	Exemplary demonstration with no weaknesses
8	Very good demonstration on virtually all aspects, some weaknesses of modest consequence
6	Reasonably good demonstration on most aspects with some weaknesses that need addressing
4	Some good aspects, some questionable/weak demonstrations that need to be addressed
2	Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
0	No demonstration

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Plan forms a solid basis for development of outcomes-based contribution agreement

✓ 10 POINTS

RUBRIC	
10	Exemplary demonstration with no weaknesses
8	Very good demonstration on virtually all aspects, some weaknesses of modest consequence
6	Reasonably good demonstration on most aspects with some weaknesses that need addressing
4	Some good aspects, some questionable/weak demonstrations that need to be addressed
2	Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
0	No demonstration

Risk strategy is thorough and adequately addresses key risks

✓ 5 POINTS

RUBRIC	
5	Exemplary demonstration with no weaknesses
4	Very good demonstration on virtually all aspects, some weaknesses of modest consequence
3	Reasonably good demonstration on most aspects with some weaknesses that need addressing
2	Some good aspects, some questionable/weak demonstrations that need to be addressed
1	Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
0	No demonstration

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CHAPTER 3: PROJECT MANAGEMENT

25 POINTS TOTAL

REQUIREMENTS

Provide a project management plan for the implementation phase, including:

- Project scope, scheduling, sequencing, and dependencies
- Resource assessment, including human, materiel, and financial (e.g. workforce capacity, infrastructure readiness, and related initiatives already underway) that are sufficient and appropriate to the achievement of outcomes
- Strategies for:
  - Risk identification and appropriate mitigation
  - Procurement, including alignment with technology and partnership requirements
  - Stakeholders, including analysis of impact and influence
  - Communications, including strategies that promote community involvement and transparency and tailor to diverse stakeholders and projects
- Monitoring, controlling, and reporting strategies and checkpoints for contingencies and course corrections, if necessary
- Approach to sustaining projects beyond the lifecycle of the Challenge, if appropriate
- Other details, as required

EVALUATION CRITERIA

Plan is detailed, complete, feasible, and well-suited to achievement of outcomes

10 POINTS TOTAL

RUBRIC	
10	Exemplary demonstration with no weaknesses
8	Very good demonstration on virtually all aspects, some weaknesses of modest consequence
6	Reasonably good demonstration on most aspects with some weaknesses that need addressing
4	Some good aspects, some questionable/weak demonstrations that need to be addressed
2	Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
0	No demonstration

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Plan supports the implementation of projects

✓ **10 POINTS**

RUBRIC	
10	Exemplary demonstration with no weaknesses
8	Very good demonstration on virtually all aspects, some weaknesses of modest consequence
6	Reasonably good demonstration on most aspects with some weaknesses that need addressing
4	Some good aspects, some questionable/weak demonstrations that need to be addressed
2	Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
0	No demonstration

Risk strategy is thorough and adequately addresses key risks

✓ **5 POINTS**

RUBRIC	
5	Exemplary demonstration with no weaknesses
4	Very good demonstration on virtually all aspects, some weaknesses of modest consequence
3	Reasonably good demonstration on most aspects with some weaknesses that need addressing
2	Some good aspects, some questionable/weak demonstrations that need to be addressed
1	Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
0	No demonstration

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CHAPTER 4: TECHNOLOGY

✓ 25 POINTS TOTAL

REQUIREMENTS

Provide a technology plan for the implementation phase, including:

- Details about the technologies, including relevant applications elsewhere and results of testing and/or piloting in finalist phase
- Approach to future-proofing the technologies (i.e. safeguards against vendor-generated proprietary constraints and obsolescence, workforce that is able to implement and operate the technologies and systems going forward)
- How the technologies comply with relevant legislative and regulatory requirements
- Adoption or development of standards, architectures, certifications, initiatives, and guidelines, including how these will enable:
  - interoperability between the technologies, other technologies, existing community systems and services, and infrastructure
  - replicability and scalability
- Roles and responsibilities of technology partners
- Accessibility and usability of the technologies to diverse users, residents, and other stakeholders that support their uptake and acceptance
- Identification of risks (e.g. privacy issues, cybersecurity breaches) and development of appropriate mitigation strategies
- Other details, as required

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EVALUATION CRITERIA

Plan is detailed, complete, feasible, and well-suited to achievement of outcomes

✓ 10 POINTS

RUBRIC	
10	Exemplary demonstration with no weaknesses
8	Very good demonstration on virtually all aspects, some weaknesses of modest consequence
6	Reasonably good demonstration on most aspects with some weaknesses that need addressing
4	Some good aspects, some questionable/weak demonstrations that need to be addressed
2	Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
0	No demonstration

Plan supports the implementation of projects

✓ 10 POINTS

RUBRIC	
10	Exemplary demonstration with no weaknesses
8	Very good demonstration on virtually all aspects, some weaknesses of modest consequence
6	Reasonably good demonstration on most aspects with some weaknesses that need addressing
4	Some good aspects, some questionable/weak demonstrations that need to be addressed
2	Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
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Risk strategy is thorough and adequately addresses key risks

✓ **5 POINTS**

RUBRIC	
5	Exemplary demonstration with no weaknesses
4	Very good demonstration on virtually all aspects, some weaknesses of modest consequence
3	Reasonably good demonstration on most aspects with some weaknesses that need addressing
2	Some good aspects, some questionable/weak demonstrations that need to be addressed
1	Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
0	No demonstration

CHAPTER 5: GOVERNANCE

✓ **20 POINTS TOTAL**

REQUIREMENTS

Provide a governance plan for the implementation phase, including:

- Governance frameworks and strategies to oversee and manage projects, project risks, funds, and partners that are rigorous, transparent, effective, and provide value for money
- Details about the partners and their role, capacity, and readiness
- Evidence (i.e. letters, agreements, other forms of written understandings) and details about the partnerships, including their nature, terms, accountability structure, and financial arrangements
- Approach to partnerships that retains community control over sensitive and personal data
- Identification of risks and development of appropriate mitigation strategies
- Other details, as required

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EVALUATION CRITERIA

Plan is detailed, complete, feasible, and well-suited to achievement of outcomes

10 POINTS

RUBRIC	
10	Exemplary demonstration with no weaknesses
8	Very good demonstration on virtually all aspects, some weaknesses of modest consequence
6	Reasonably good demonstration on most aspects with some weaknesses that need addressing
4	Some good aspects, some questionable/weak demonstrations that need to be addressed
2	Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
0	No demonstration

Plan, including partnerships, supports the implementation of projects

5 POINTS

RUBRIC	
5	Exemplary demonstration with no weaknesses
4	Very good demonstration on virtually all aspects, some weaknesses of modest consequence
3	Reasonably good demonstration on most aspects with some weaknesses that need addressing
2	Some good aspects, some questionable/weak demonstrations that need to be addressed
1	Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
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Risk strategy is thorough and adequately addresses key risks

✓ **5 POINTS**

RUBRIC	
5	Exemplary demonstration with no weaknesses
4	Very good demonstration on virtually all aspects, some weaknesses of modest consequence
3	Reasonably good demonstration on most aspects with some weaknesses that need addressing
2	Some good aspects, some questionable/weak demonstrations that need to be addressed
1	Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
0	No demonstration

CHAPTER 6: ENGAGEMENT

✓ **30 POINTS TOTAL**

REQUIREMENTS

- Provide an engagement plan for the implementation phase, including:
- Approach to engaging with, gaining acceptance from, and onboarding residents and other stakeholders for projects that ensures ongoing alignment between the outcomes and their concerns and needs
- Insights gained through previous engagement processes with residents that shaped the final proposal in a significant way
- Tools used in past, planned, and ongoing engagement activities that are adapted to target different population groups and encourage ongoing, high participation
- Efforts made to be inclusive and consider the diversity of residents, including the ways in which certain population groups could be positively/negatively and intentionally/unintentionally affected by projects
- Experienced or expected reactions from residents and other stakeholders and approaches for managing potential issues
- Identification of risks and development of appropriate mitigation strategies
- Other details, as required

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EVALUATION CRITERIA

Engagement to date and plans to engage residents and other stakeholders in the implementation phase are detailed, complete, inclusive, meaningful, and well-suited to achieve the outcomes

✓ 10 POINTS

RUBRIC	
10	Exemplary demonstration with no weaknesses
8	Very good demonstration on virtually all aspects, some weaknesses of modest consequence
6	Reasonably good demonstration on most aspects with some weaknesses that need addressing
4	Some good aspects, some questionable/weak demonstrations that need to be addressed
2	Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
0	No demonstration

Plan supports the implementation of projects

✓ 5 POINTS

RUBRIC	
5	Exemplary demonstration with no weaknesses
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1	Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
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Diversity and inclusion are reflected in project design, and facilitate the implementation of projects

✓ 10 POINTS

RUBRIC	
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Risk strategy is thorough and adequately addresses key risks

✓ 5 POINTS

RUBRIC	
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CHAPTER 7: DATA AND PRIVACY

✓ 25 POINTS TOTAL

REQUIREMENTS

Provide a data management plan for the implementation phase, including:

- Preliminary Privacy Impact Assessment (PIA) or Preliminary Rationale Analysis (PRA) with evidence that relevant privacy authorities were consulted and their guidance was considered in its development
- The ways in which the data management plan complies with Personal Information Protection and Electronic Documents Act (PIPEDA) and other relevant municipal, provincial/territorial, or federal privacy regimes
- Types and methods of data collection, generation, analysis, storage, and transmission, and plans for re-use, re-distribution, derivative production, archiving, and preservation that reflects the entire data lifecycle in project design
- Efforts made to integrate security and privacy considerations into project design, particularly those that were raised by users, residents, and other stakeholders
- Efforts made to adhere to the following principles:
  - Governance: strong governance frameworks and meaningful resident engagement throughout the lifecycle of projects
  - Ownership and control: avoidance of private-sector ownership and control of publicly-sourced data and community-owned and controlled data approaches
  - Consent: respect for meaningful consent in data collection, use, and disclosure
  - Data minimization and de-identification: pursuit of less privacy-invasive alternatives wherever possible and de-identification of all personal information at the earliest opportunity and mitigation of potential for re-identification
  - Accessibility: accessible, interoperable, and open data approaches to drive community-based solutions
  - Security: secure storage and transmission of data and assurance of effective cybersecurity
- Open and big data strategies, including the ways in which they facilitate transferability and replicability of technologies and projects
- Identification of risks and development of appropriate mitigation strategies
- Other details, as required

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EVALUATION CRITERIA

Plan is detailed, complete, high quality, and well-suited to achievement of outcomes

✓ **10 POINTS**

RUBRIC	
10	Exemplary demonstration with no weaknesses
8	Very good demonstration on virtually all aspects, some weaknesses of modest consequence
6	Reasonably good demonstration on most aspects with some weaknesses that need addressing
4	Some good aspects, some questionable/weak demonstrations that need to be addressed
2	Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
0	No demonstration

Plan supports the implementation of projects

✓ **5 POINTS**

RUBRIC	
5	Exemplary demonstration with no weaknesses
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2	Some good aspects, some questionable/weak demonstrations that need to be addressed
1	Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
0	No demonstration

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Open and big data strategies are employed to the extent possible and facilitate transferability and replicability of technologies and projects

✓ 5 POINTS

RUBRIC	
5	Exemplary demonstration with no weaknesses
4	Very good demonstration on virtually all aspects, some weaknesses of modest consequence
3	Reasonably good demonstration on most aspects with some weaknesses that need addressing
2	Some good aspects, some questionable/weak demonstrations that need to be addressed
1	Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
0	No demonstration

Risk strategy is thorough and adequately addresses key risks

✓ 5 POINTS

RUBRIC	
5	Exemplary demonstration with no weaknesses
4	Very good demonstration on virtually all aspects, some weaknesses of modest consequence
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CHAPTER 8: FINANCIAL

✓ 25 POINTS

REQUIREMENTS

Provide a financial plan for the implementation phase, including:

- Comprehensive project budget with a detailed breakdown of projected revenues, if any, and expenses by year, source, and cost type (including identification of hard and soft as well as direct and indirect costs) that is reasonable, sufficient, and in line with the performance measurement plan
- Methods, sources, and assumptions that result in class B (substantive) estimates of revenues, if any, and expenses at a minimum
- Contributions (financial or in-kind) from other sources, and approach to leverage revenues, if any, and the prize money that amplifies the impact and reach of projects
- Financial tools and accounting methodologies that are appropriate for projects
- Identification of risks and development of appropriate mitigation strategies
- Report on the use of the finalist grant, including reasonable justification of any divergences from the plan laid out in the application
- Other details, as required

EVALUATION CRITERIA

Plan is detailed, complete, high quality, and well-suited to achievement of outcomes

✓ 10 POINTS

RUBRIC	
10	Exemplary demonstration with no weaknesses
8	Very good demonstration on virtually all aspects, some weaknesses of modest consequence
6	Reasonably good demonstration on most aspects with some weaknesses that need addressing
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Plan supports the implementation of projects

✓ 5 POINTS

RUBRIC	
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4	Very good demonstration on virtually all aspects, some weaknesses of modest consequence
3	Reasonably good demonstration on most aspects with some weaknesses that need addressing
2	Some good aspects, some questionable/weak demonstrations that need to be addressed
1	Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
0	No demonstration

Report on the use of the finalist grant is detailed, complete, and demonstrates a rational and effective use for the development of the final proposal and sound management of project funding

✓ 5 POINTS

RUBRIC	
5	Exemplary demonstration with no weaknesses
4	Very good demonstration on virtually all aspects, some weaknesses of modest consequence
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Risk strategy is thorough and adequately addresses key risks

✓ 5 POINTS

RUBRIC	
5	Exemplary demonstration with no weaknesses
4	Very good demonstration on virtually all aspects, some weaknesses of modest consequence
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0	No demonstration

CHAPTER 9: IMPLEMENTATION PHASE REQUIREMENTS

✓ 10 POINTS TOTAL

REQUIREMENTS

This chapter requires you to identify and provide the plans for meeting applicable municipal, provincial, and federal reporting and legislative and policy requirements should you be selected as a winner.

These requirements are:

- Duty to consult with Indigenous groups
- Modern Treaty obligations
- Community Employment Benefit (CEB)
- Climate Lens Assessment (CLA)
- Other applicable laws and regulations and policies, including any cases of change or exemption to legislation and regulations that may apply to projects

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EVALUATION CRITERIA

Plans for meeting relevant municipal, provincial, and federal reporting and legislative requirements are provided and serve as sufficient groundwork for the implementation phase should the finalist be selected as a winner

✓ 5 POINTS

RUBRIC	
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4	Very good demonstration on virtually all aspects, some weaknesses of modest consequence
3	Reasonably good demonstration on most aspects with some weaknesses that need addressing
2	Some good aspects, some questionable/weak demonstrations that need to be addressed
1	Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
0	No demonstration

Risk strategy is thorough and adequately addresses key risks

✓ 5 POINTS

RUBRIC	
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ATIA - 19(1)

Bouchard, Kathleen (INFC)

From: Seto, David [redacted]
Sent: March 25, 2019 9:48 AM
To: Bouchard, Kathleen (INFC)
Cc: Baird, Matthew (INFC); Ahmar, Karim
Subject: INFC | Smart Cities Challenge - Weekly Status Report for Week Ending March 22nd, 2019
Attachments: Weekly Status Report - March 22 2019.pdf

Hi Kathleen,

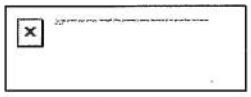
Attached is the Weekly Status Report for the week ending March 22nd, 2019.

Please let us know if you have any questions or comments.

Kindest Regards,

David

David Seto | Senior Director, Advisory Services
Raymond Chabot Grant Thornton
Direct Line [redacted] | Mobile [redacted]
116 Albert Street, Suite 1000, Ottawa, ON K1P 5G3



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Infrastructure Canada Weekly Status Report			
Project Name	Smart Cities Challenge - Finalist Proposals Evaluation		
Date	03/22/2019	**Reporting Period**	03/16/2019 to 03/22/2019

Distribution List:			
Project Authority	**Kathleen Bouchard** **Jenny Tremblay** **Matthew Baird**	**RCGT Project Lead**	**David Seto**

1. Overall Project Status

Scope	Completed adjustments to the Methodology and Project Plan, and Project Charter inclusive of the composition of project teams. Completed Assessment Report #1 (D4A) for [redacted] SME review of remaining 19 proposals ongoing.
Budget	See Appendix A of status report for budget details.
Schedule	Project on schedule.

2. Major Milestones/Deliverables Performance

Milestone / Deliverable	Planned Completion Date	Date Approved by Project Authority	Status (See Legend Below)
Introductory Meeting (D1A)	02/07/2019	02/07/2019	Completed
Preparatory Work (D1B)	03/06/2019	03/09/2019	Completed
Methodology and Project Plan (D2A)	03/01/2019	03/01/2019	Completed
As required: adjustments to the Methodology and Project Plan, inclusive of the composition of project teams, following review of finalist proposals (D2B)	03/12/2019	03/12/2019	Completed
Assessment Report #1 (D4A)	03/22/2019	03/22/2019	Completed
Assessment Reports #2 to #20 (D4B –D4T)	04/08/2019		

- GREEN – On target to achieve Planned Delivery Date.
- AMBER – Planned Target Delivery Date is in danger of not being achieved but a managed solution capable of bringing forward the actual delivery date is being applied.
- RED – Planned Target Delivery Date is not going to be achieved or has already passed. No work rounds or solutions capable

2. Major Milestones/Deliverables Performance			
Milestone / Deliverable	**Planned Completion Date**	**Date Approved by Project Authority**	**Status (See Legend Below)**
of bringing forward the planned dates are available.			

3. Activities & Risks/Issue Monitoring	
Activity Description	**Date of Completion**
Key Activities Completed over the Reporting Period	
Assessment Report #1 [redacted]	03/19/2019
Final Draft Assessment Report #1 [redacted]	03/22/2019
Assessment Report #2 - #20	Ongoing
Key Activities Planned for Next Reporting Period	
Assessment Report #2 - #20	Ongoing

Risks/Issue Management

No.	Risk/Issue Description	Mitigation Strategy	Date Approved by Project Authority
1	Resource availability	RCGT will engage an equally qualified resource from the pool of experts from our national network of resources	02/06/2019
2	Conflicts of Interest	RCGT has already completed Conflict Checks for each of the proposed team members. If additional resources are required, Conflict Checks will be completed prior to any participation in the project. Nationwide Conflict Check underway to identify any potential conflicts of interest between the 20 Finalists and any of our other offices.	02/06/2019

Appendix A

Budget reporting – work completed versus budget spent to date, as at 3/22/2019.

Total Fees (Budget)	Fees Incurred to Date	Travel
$280,500	[redacted]	$0

Poirier2, Eric (INFC)

From:	Poirier2, Eric (INFC)
Sent:	March 26, 2019 9:20 AM
To:	Williams, Tushara (INFC)
Cc:	Tremblay, Jenny (INFC); Courval, Manon (INFC); Long, Alexander (INFC); Fletcher-Kyle, Ashley (INFC)
Subject:	FOR CONSULTATION: Climate Lens Assessment Plans - Richmond Final Proposal
Attachments:	Smart Cities Challenge - Webinar Presentation - 28Aug2018 (EN).ppt; Richmond Final Proposal - Implementation Phase Requirements.pdf; Consolidated Evaluation Criteria (Finalist Guide).pdf

Bonjour Tushara,

As Jenny mentioned at a recent Branch management meeting, there may be a few Smart Cities Challenge final proposals that require the view of policy experts within INFC or beyond to assist in our review process in support of the Smart Cities Challenge Jury.

The Richmond project is within the scope of application of the Climate Lens Assesment process and they have identified in their final proposal their plans to meet their obligations in this regard. Could your CLA folks have a look and give us some feedback about how this lines up with INFC expectations on a CLA?

We have attached the following:

- Richmond Final Proposal section on CLA for review
- Webinar presentation used to explain obligations to finalists for reference (pages 8-12, specifically)
- Finalist Guide excerpt (criteria relevant to CLA are in Chapter 9) for reference
- The full final proposal is online

Any written views would be most welcome by noon on Friday (if at all possible). We would also be happy to meet with your folks to talk this through.

Au plaisir,
EP

Eric Poirier

Directeur principal, Défi des villes intelligentes
Infrastructure Canada / Gouvernement du Canada
eric.poirier2@canada.ca / Tél: 613-957-2460 (nouveau!)

Senior Director, Smart Cities Challenge
Infrastructure Canada / Government of Canada
eric.poirier2@canada.ca / Tel: 613-957-2460 (new!)

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Canada

SMART CITIES CHALLENGE

Finalist Webinar #2:

Implementation Phase Requirements

August 28, 2018

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AGENDA

- Overview
- Community Employment Benefits (CEB)
- Climate Lens Assessment (CLA)
- Duty to Consult and Modern Treaty obligations
- Other applicable laws, regulations and policies
- Communications touch base
- Next steps

Community Employment Benefits (CEB)

COMMUNITY EMPLOYMENT BENEFIT (CEB)

- Encourage communities to diversify recruitment, training and procurement practices
- Gather data on best practices across Canada, highlighting opportunities and challenges faced by construction industry and related sectors
- Results will be reported annually over the course of the project

http://www.infrastructure.gc.ca/pub/other-autre/ceb-ace-eng.html

TARGETED GROUPS

- Groups targeted by the CEB initiative include:
    - Indigenous peoples
    - Women
    - Youth
    - People with disabilities
    - Veterans
    - Recent Immigrants
    - Apprentices
    - Small and Medium Enterprises
    - Social Enterprises

NEXT STEPS FOR FINALISTS

- If selected as a winner, what are your plans for:
  - Identifying target groups that would benefit from your projects as well as goals for each group
  - Reporting on the CEB, including submission timelines
  - Collecting, managing, and tracking the required data
- Remember to reflect these plans in relevant chapters of your final proposal (e.g. project management, engagement, data and privacy, financial)

Q&A

Submit questions using the chat function

Climate Lens Assessment (CLA)

ABOUT THE CLIMATE LENS

- Assess expected greenhouse gas (GHG) emissions and/or resilience to the impacts of climate change
- Applies to winners whose projects have a total value of more than $10 million and have either a climate change adaptation or mitigation focus

http://www.infrastructure.gc.ca/pub/other-autre/cl-occ-eng.html

GREENHOUSE GAS MITIGATION ASSESSMENT

- Measure a project's anticipated GHG emissions impact
- Scope includes direct and significant indirect effects (emissions and reductions)
- Timeline includes construction, operations, and maintenance over the asset's expected life
- [Project Emissions] – [Baseline Emissions] = [Overall Emissions]

CLIMATE CHANGE RESILIENCE ASSESSMENT

- Analysis of future climate conditions and risk treatment
- Plans to projects resilient to future climate conditions and impacts
- Attestation by qualified party

NEXT STEPS FOR FINALISTS

- *If the CLA pertains to you*, and if selected as a winner, what are your plans for:
  - Conducting the CLA, submission timelines, and who would complete/attest to it
  - How much it would cost
  - Collecting, managing, and tracking the required data
- Remember to reflect these plans in relevant chapters of your final proposal (e.g. project management, engagement, data and privacy, financial)
- *If the CLA does not pertain to you*, state that the total cost of projects with a primary focus on climate change adaptation, resilience, disaster mitigation, or a reduction in GHG emissions is less than $10 million

Q&A

Submit questions using the "chat" function

Other applicable laws, regulations and policies

Duty to Consult and Modern Treaty obligations

FINALIST CONSIDERATIONS

- The Finalist Guide lists the Duty to Consult and Modern Treaties as implementation requirements to consider
- These are listed in order to raise awareness and ensure that Finalists take the time to consider whether these may be triggered in the context of their proposal
- Regardless, in the spirit of Reconciliation, we encourage you to engage with any Indigenous peoples in your community
- Indigenous peoples will bring new perspectives, expertise, and interests to your project that you may not have considered

Q&A

Submit questions using the "chat" function

Communications touch-base

NEXT STEPS

- Next webinar: Sept 11, 12:30 p.m. EST
- Reminder: sign and return grant agreements
- Site visit: discuss with Primary Contact potential dates and activities
- Finalist Fall forum: early November (exact date TBD)

IMPLEMENTATION PHASE REQUIREMENTS

Our Smart Cities projects have been planned to address our various requirements and commitments to our residents and other stakeholders. This includes our commitments to meet applicable municipal, provincial, and federal reporting and legislative and policy requirements.

9.1 INDIGENOUS ENGAGEMENT

We recognize the importance of good faith engagement and understand the legal duty to consult for the Provincial and Federal Governments may be triggered by any Crown conduct that may adversely impact any potential or established Aboriginal or Treaty rights. We have established relationships with neighbouring First Nations. These include the Musqueam Indian Band, Tsawwassen First Nation, and Squamish First Nation.

Our engagement procedures support the federal and provincial guidelines, including the federal Aboriginal Consultation and Accommodation – updated Guidelines for Federal Officials to Fulfill the Duty to Consult (March 2011) and the provincial guidelines, Updated Procedures for Meeting Legal Obligations when Consulting with First Nations (May 2012).

The City of Richmond has a long-term relationship with the Musqueam Indian Band. Musqueam representatives have participated on the Advisory Committee for the Smart Cities Challenge. We intend to collaborate to develop technology solutions that can help the Musqueam people as they see fit. By their participation as a member of our Advisory Committee, we want to ensure that the needs and interests of their community are addressed as we move to the implementation phase of the Smart Cities projects.

We have reached out to all three First Nations to begin dialogue on our Smart Cities Challenge program.

9.2 COMMUNITY EMPLOYMENT BENEFIT (CEB)

Richmond is a vibrant, rapidly developing city with a strong economy that has attracted thousands of its residents from around the world. Our population has the highest proportion of immigrants of any city in Canada. 74% of our population originates from Asia-Pacific countries with at least 54% speaking a language other than English or French at home. The City recognizes the importance of reflecting this cultural diversity in our workforce in order to effectively serve the diverse needs of the community, through the award winning Human Resources program for people with disabilities.

To support our commitment to workplace diversity, the City of Richmond offers a variety of intercultural awareness training initiatives to increase the level of employee awareness and understanding within the workforce. We employ two full-time diversity coordinators and we are working to incorporate diversity and cultural awareness as part of our Respectful Workplace Policy. Richmond also provides a new immigrant welcome package, in multiple languages, to help new residents tap into the wide range of support services offered.

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9.2 COMMUNITY EMPLOYMENT BENEFIT (CEB)

Promotion of diversity is demonstrated through:

- Applying different problem solving skills towards a common goal
- Building relationships with different community groups
- Embracing diverse perspectives and approaches that foster innovation
- Guiding decision making and planning through inclusion, cooperation, dynamism, integration, and equality
- Providing equal opportunity in all areas of our work
- Implementing systems and procedures that consider individual differences in all aspects of our service and planning delivery

We are committed to participate in Infrastructure Canada's Community Employment Benefits Initiative. We already have a strong commitment to workplace diversity and are dedicated to continue our diversity strategy with our Smart Cities Projects. We will continue to provide employment and/or procurement opportunities to the groups targeted by the CEB initiative including apprentices; Indigenous peoples; women; persons with disabilities; veterans; youth; recent immigrants; and small-sized, medium-sized and social enterprises. We will establish specific targets for our projects, allowing for flexibility to consider various factors such as complementing our existing employment initiatives and our local labour market dynamics.

9.3 REPORTING

We will provide Infrastructure Canada with our benefit targets for the federal target groups listed above. This will be completed as soon as possible after the Challenge award outcome. We will report annually on our progress against the targets for each project which will include the number of hours worked by a target population and/or the value of contracts provided to target groups. We will identify key successes as well as any challenges in attempting to meet the project targets. We have assigned a dedicated resource who will collect, manage and track the required data to report against our targets.

9.4 CLIMATE LENS ASSESSMENT

The City of Richmond has a strong commitment to addressing and mitigating climate change. The City has achieved carbon neutral status annually since 2013 and anticipates maintaining that status for the foreseeable future. From 2007 to 2015, the City reduced Greenhouse Gas emissions by 12%, despite a population growth of 12% in the same period.

We are committed to undertaking a comprehensive Climate Lens Assessment to provide meaningful insight into the climate impacts of individual projects and to ensure consistency with shared federal, provincial and territorial objectives articulated in the Pan-Canadian Framework for Clean Growth and Climate Change.

As our project has both climate change mitigation and climate change adaptation, resilience and disaster mitigation elements, we will conduct both requirements under the Climate Lens Assessment: the GHG Mitigation Assessment and the Climate Change Resilience Assessment.

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9.4.1 GREENHOUSE GAS MITIGATION ASSESSMENT

We will procure a qualified assessor (i.e., a professional engineer or GHG Accounting Professional) to conduct the assessment who will provide an attestation confirming that the assessment conforms to the guidance provided by Infrastructure Canada and aligns with the relevant assessment standard. Our Mitigation Assessments will consider the same greenhouse gases tracked through Canada's National Inventory Report and will include all direct and all significant indirect emissions. We will assess each project across the construction and operations and maintenance phases, and will include estimates of a project's cumulative construction and operations and maintenance emissions over the useful lifespan of the infrastructure.

Our Assessment will include the following components:

- Baseline GHG Emissions Calculations
- Estimate GHG Emissions of Assets
- Net increase / reduction in GHG emissions
- Cost-per-tonne calculations
- Identification of GHG mitigation opportunities

9.4.2 CLIMATE CHANGE RESILIENCE ASSESSMENT

We will procure a qualified assessor (i.e., a professional engineer or GHG Accounting Professional) to conduct the assessment to identify, evaluate and manage risks, resulting in reducing the risk to an acceptable level by enhancing the resilience or adaptability of assets or systems to climate change impacts. They will provide an attestation confirming that the assessment conforms to Infrastructure Canada's Climate Lens Guidance.

The assessment will support more informed decision-making during an infrastructure project's planning and design stages and it will therefore consider the full range of project design choices being made (i.e., location, materials used, construction methods/standards etc.). It will also consider the climate risks during construction and planned operation and maintenance phases and will include asset-specific resilience solutions as well as identify potential upstream and downstream impacts of the proposed solutions within the broader environment. The timescale of our assessment will match the intended lifespan of the asset.

Our assessment will include identification and assessment of climate change risks. Risk will be assessed using the following order and naming convention:

- Climate change hazard
- Impact on asset
- Consequence of impact

9.4.3 ANALYSIS OF RISK, CONSEQUENCES, LIKELIHOOD, AND VULNERABILITY

After identifying and assessing each risk we will conduct an analysis to identify the magnitude of the consequence of an event and its likelihood of occurring. This will be considered in the context of the climate change scenarios being evaluated and the existing controls to manage the risk.

Please find a completed Climate Lens for GHG Change Resilience Assessment from a recent previous project in Appendix 9.1.

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9.5 RESILIENCE MEASURES

We will identify which resilience measures have been analyzed and implemented, including the projected change in resilience as a result. We will also justify why particular risks are not being mitigated against and identify any anticipated residual risk flowing mitigation measures (if any). Where possible we will calculate the return on investment of the projects through a Loss Estimation Analysis and a Return on Mitigation Investment calculation.

9.6 OTHER APPLICABLE LAWS, REGULATIONS, AND POLICIES

We have completed a full review of any applicable laws, regulations and policies and have dedicated resources to ensure that our Smart Cities projects meet all requirements under them. We have identified the following applicable laws, regulations and policies:

- Freedom of Information and Protection of Privacy Act
- Local Government Act
- Fire Safety Act (Bill 4)
- Occupational Health and Safety Regulation
- Safety Authority Act
- Safety Standards Act
- Workers Compensation Act
- Environmental Assessment Act
- Information Management Regulation

9.7 RISKS AND MITIGATION

Table 9.7 Implementation Phase Risks and Mitigation

RISK	DESCRIPTION	MITIGATION
Requirements and commitments are not well understood	Projects proceed without knowledge or understanding of commitments and requirements.	Project plans incorporate legislative requirements and other commitments that inform planning, tracking, reporting and implementation impacts.
Non-compliance to commitments made and requirements	As project activities progress, commitments and legislative requirements are missed.	Strong project governance processes that include a compliance log and reporting that specifically track progress against commitments and requirements.
Lack of baseline data and data collection	Baseline data is incomplete or inaccurate and/or data collection against baseline is insufficient or flawed.	Baseline data is approved through the project governance structure and data collection processes are identified, checked and included in project plans and execution documents.

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APPENDIX 4: CONSOLIDATED REQUIREMENTS & EVALUATION CRITERIA

EXECUTIVE SUMMARY

REQUIREMENTS

Provide an executive summary of your final proposal, including:

- Reiteration of the Challenge Statement
- Overview of the upcoming nine chapters

EVALUATION CRITERIA

N/A

RUBRIC

N/A

CHAPTER 1: VISION

✓ **15 POINTS TOTAL**

REQUIREMENTS

Present your smart cities journey, including:

- How your final proposal carries through the vision laid out in your Challenge Statement and the outcomes in your application, and provides reasonable justification of any variations
- How your outcomes continue to be:
  - reflective of the true needs of the community, as demonstrated through a compelling body of data and evidence and extensive resident engagement
  - ambitious and achievable
  - meaningful for the community and its residents
  - well-suited to a smart cities approach
  - measurable
- Progress towards outcomes that may have been achieved during the finalist phase
- Reasons to be selected as a winner

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EVALUATION CRITERIA

Final proposal is driven by the Challenge Statement and carries through the vision laid out in the application:

✓ **5 POINTS**

RUBRIC	
5	Exemplary demonstration with no weaknesses
4	Very good demonstration on virtually all aspects, some weaknesses of modest consequence
3	Reasonably good demonstration on most aspects with some weaknesses that need addressing
2	Some good aspects, some questionable/weak demonstrations that need to be addressed
1	Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
0	No demonstration

Final proposal is transformative, scalable, and replicable within the community and to other communities in Canada:

✓ **10 POINTS**

RUBRIC	
10	Exemplary demonstration with no weaknesses
8	Very good demonstration on virtually all aspects, some weaknesses of modest consequence
6	Reasonably good demonstration on most aspects with some weaknesses that need addressing
4	Some good aspects, some questionable/weak demonstrations that need to be addressed
2	Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
0	No demonstration

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CHAPTER 2: PERFORMANCE MEASUREMENT

✓ **25 POINTS TOTAL**

REQUIREMENTS

Provide an outcomes-based performance measurement plan for the implementation phase, including:

- Project activities and their links to outputs and outcomes
- Project timelines, deliverables, and milestones that are ambitious yet attainable
- Payment schedule with amounts that are reasonable and rational in the context of project timelines, deliverables, milestones, and prize category
- Qualitative and quantitative performance indicators and related data sources that are meaningful and can measure short, medium, and long-term progress towards outcomes
- Monitoring, reporting, and evaluation strategies and checkpoints for contingencies and course corrections, if necessary
- Identification of risks and development of appropriate mitigation strategies
- Other details, as required

EVALUATION CRITERIA

Plan is detailed, complete, feasible, and well-suited to achieve the outcomes

✓ **10 POINTS**

RUBRIC	
10	Exemplary demonstration with no weaknesses
8	Very good demonstration on virtually all aspects, some weaknesses of modest consequence
6	Reasonably good demonstration on most aspects with some weaknesses that need addressing
4	Some good aspects, some questionable/weak demonstrations that need to be addressed
2	Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
0	No demonstration

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Plan forms a solid basis for development of outcomes-based contribution agreement

✓ **10 POINTS**

RUBRIC	
10	Exemplary demonstration with no weaknesses
8	Very good demonstration on virtually all aspects, some weaknesses of modest consequence
6	Reasonably good demonstration on most aspects with some weaknesses that need addressing
4	Some good aspects, some questionable/weak demonstrations that need to be addressed
2	Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
0	No demonstration

Risk strategy is thorough and adequately addresses key risks

✓ **5 POINTS**

RUBRIC	
5	Exemplary demonstration with no weaknesses
4	Very good demonstration on virtually all aspects, some weaknesses of modest consequence
3	Reasonably good demonstration on most aspects with some weaknesses that need addressing
2	Some good aspects, some questionable/weak demonstrations that need to be addressed
1	Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
0	No demonstration

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CHAPTER 3: PROJECT MANAGEMENT

25 POINTS TOTAL

REQUIREMENTS

Provide a project management plan for the implementation phase, including:

- Project scope, scheduling, sequencing, and dependencies
- Resource assessment, including human, materiel, and financial (e.g. workforce capacity, infrastructure readiness, and related initiatives already underway) that are sufficient and appropriate to the achievement of outcomes
- Strategies for:
  - Risk identification and appropriate mitigation
  - Procurement, including alignment with technology and partnership requirements
  - Stakeholders, including analysis of impact and influence
  - Communications, including strategies that promote community involvement and transparency and tailor to diverse stakeholders and projects
- Monitoring, controlling, and reporting strategies and checkpoints for contingencies and course corrections, if necessary
- Approach to sustaining projects beyond the lifecycle of the Challenge, if appropriate
- Other details, as required

EVALUATION CRITERIA

Plan is detailed, complete, feasible, and well-suited to achievement of outcomes

10 POINTS TOTAL

RUBRIC	
10	Exemplary demonstration with no weaknesses
8	Very good demonstration on virtually all aspects, some weaknesses of modest consequence
6	Reasonably good demonstration on most aspects with some weaknesses that need addressing
4	Some good aspects, some questionable/weak demonstrations that need to be addressed
2	Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
0	No demonstration

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Plan supports the implementation of projects

✓ **10 POINTS**

RUBRIC	
10	Exemplary demonstration with no weaknesses
8	Very good demonstration on virtually all aspects, some weaknesses of modest consequence
6	Reasonably good demonstration on most aspects with some weaknesses that need addressing
4	Some good aspects, some questionable/weak demonstrations that need to be addressed
2	Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
0	No demonstration

Risk strategy is thorough and adequately addresses key risks

✓ **5 POINTS**

RUBRIC	
5	Exemplary demonstration with no weaknesses
4	Very good demonstration on virtually all aspects, some weaknesses of modest consequence
3	Reasonably good demonstration on most aspects with some weaknesses that need addressing
2	Some good aspects, some questionable/weak demonstrations that need to be addressed
1	Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
0	No demonstration

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CHAPTER 4: TECHNOLOGY

25 POINTS TOTAL

REQUIREMENTS

Provide a technology plan for the implementation phase, including:

- Details about the technologies, including relevant applications elsewhere and results of testing and/or piloting in finalist phase
- Approach to future-proofing the technologies (i.e. safeguards against vendor-generated proprietary constraints and obsolescence, workforce that is able to implement and operate the technologies and systems going forward)
- How the technologies comply with relevant legislative and regulatory requirements
- Adoption or development of standards, architectures, certifications, initiatives, and guidelines, including how these will enable:
  - interoperability between the technologies, other technologies, existing community systems and services, and infrastructure
  - replicability and scalability
- Roles and responsibilities of technology partners
- Accessibility and usability of the technologies to diverse users, residents, and other stakeholders that support their uptake and acceptance
- Identification of risks (e.g. privacy issues, cybersecurity breaches) and development of appropriate mitigation strategies
- Other details, as required

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EVALUATION CRITERIA

Plan is detailed, complete, feasible, and well-suited to achievement of outcomes

✓ **10 POINTS**

RUBRIC	
10	Exemplary demonstration with no weaknesses
8	Very good demonstration on virtually all aspects, some weaknesses of modest consequence
6	Reasonably good demonstration on most aspects with some weaknesses that need addressing
4	Some good aspects, some questionable/weak demonstrations that need to be addressed
2	Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
0	No demonstration

Plan supports the implementation of projects

✓ **10 POINTS**

RUBRIC	
10	Exemplary demonstration with no weaknesses
8	Very good demonstration on virtually all aspects, some weaknesses of modest consequence
6	Reasonably good demonstration on most aspects with some weaknesses that need addressing
4	Some good aspects, some questionable/weak demonstrations that need to be addressed
2	Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
0	No demonstration

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Risk strategy is thorough and adequately addresses key risks

✓ **5 POINTS**

RUBRIC	
5	Exemplary demonstration with no weaknesses
4	Very good demonstration on virtually all aspects, some weaknesses of modest consequence
3	Reasonably good demonstration on most aspects with some weaknesses that need addressing
2	Some good aspects, some questionable/weak demonstrations that need to be addressed
1	Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
0	No demonstration

CHAPTER 5: GOVERNANCE

✓ **20 POINTS TOTAL**

REQUIREMENTS

Provide a governance plan for the implementation phase, including:

- Governance frameworks and strategies to oversee and manage projects, project risks, funds, and partners that are rigorous, transparent, effective, and provide value for money
- Details about the partners and their role, capacity, and readiness
- Evidence (i.e. letters, agreements, other forms of written understandings) and details about the partnerships, including their nature, terms, accountability structure, and financial arrangements
- Approach to partnerships that retains community control over sensitive and personal data
- Identification of risks and development of appropriate mitigation strategies
- Other details, as required

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EVALUATION CRITERIA

Plan is detailed, complete, feasible, and well-suited to achievement of outcomes

✓ **10 POINTS**

RUBRIC	
10	Exemplary demonstration with no weaknesses
8	Very good demonstration on virtually all aspects, some weaknesses of modest consequence
6	Reasonably good demonstration on most aspects with some weaknesses that need addressing
4	Some good aspects, some questionable/weak demonstrations that need to be addressed
2	Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
0	No demonstration

Plan, including partnerships, supports the implementation of projects

✓ **5 POINTS**

RUBRIC	
5	Exemplary demonstration with no weaknesses
4	Very good demonstration on virtually all aspects, some weaknesses of modest consequence
3	Reasonably good demonstration on most aspects with some weaknesses that need addressing
2	Some good aspects, some questionable/weak demonstrations that need to be addressed
1	Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
0	No demonstration

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Risk strategy is thorough and adequately addresses key risks

- **5 POINTS**

RUBRIC	
5	Exemplary demonstration with no weaknesses
4	Very good demonstration on virtually all aspects, some weaknesses of modest consequence
3	Reasonably good demonstration on most aspects with some weaknesses that need addressing
2	Some good aspects, some questionable/weak demonstrations that need to be addressed
1	Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
0	No demonstration

CHAPTER 6: ENGAGEMENT

- **30 POINTS TOTAL**

REQUIREMENTS

- Provide an engagement plan for the implementation phase, including:
- Approach to engaging with, gaining acceptance from, and onboarding residents and other stakeholders for projects that ensures ongoing alignment between the outcomes and their concerns and needs
- Insights gained through previous engagement processes with residents that shaped the final proposal in a significant way
- Tools used in past, planned, and ongoing engagement activities that are adapted to target different population groups and encourage ongoing, high participation
- Efforts made to be inclusive and consider the diversity of residents, including the ways in which certain population groups could be positively/negatively and intentionally/unintentionally affected by projects
- Experienced or expected reactions from residents and other stakeholders and approaches for managing potential issues
- Identification of risks and development of appropriate mitigation strategies
- Other details, as required

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EVALUATION CRITERIA

Engagement to date and plans to engage residents and other stakeholders in the implementation phase are detailed, complete, inclusive, meaningful, and well-suited to achieve the outcomes

✓ **10 POINTS**

RUBRIC	
10	Exemplary demonstration with no weaknesses
8	Very good demonstration on virtually all aspects, some weaknesses of modest consequence
6	Reasonably good demonstration on most aspects with some weaknesses that need addressing
4	Some good aspects, some questionable/weak demonstrations that need to be addressed
2	Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
0	No demonstration

Plan supports the implementation of projects

✓ **5 POINTS**

RUBRIC	
5	Exemplary demonstration with no weaknesses
4	Very good demonstration on virtually all aspects, some weaknesses of modest consequence
3	Reasonably good demonstration on most aspects with some weaknesses that need addressing
2	Some good aspects, some questionable/weak demonstrations that need to be addressed
1	Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
0	No demonstration

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Diversity and inclusion are reflected in project design, and facilitate the implementation of projects

✓ **10 POINTS**

RUBRIC	
10	Exemplary demonstration with no weaknesses
8	Very good demonstration on virtually all aspects, some weaknesses of modest consequence
6	Reasonably good demonstration on most aspects with some weaknesses that need addressing
4	Some good aspects, some questionable/weak demonstrations that need to be addressed
2	Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
0	No demonstration

Risk strategy is thorough and adequately addresses key risks

✓ **5 POINTS**

RUBRIC	
5	Exemplary demonstration with no weaknesses
4	Very good demonstration on virtually all aspects, some weaknesses of modest consequence
3	Reasonably good demonstration on most aspects with some weaknesses that need addressing
2	Some good aspects, some questionable/weak demonstrations that need to be addressed
1	Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
0	No demonstration

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CHAPTER 7: DATA AND PRIVACY

✓ **25 POINTS TOTAL**

REQUIREMENTS

Provide a data management plan for the implementation phase, including:

- Preliminary Privacy Impact Assessment (PIA) or Preliminary Rationale Analysis (PRA) with evidence that relevant privacy authorities were consulted and their guidance was considered in its development
- The ways in which the data management plan complies with Personal Information Protection and Electronic Documents Act (PIPEDA) and other relevant municipal, provincial/territorial, or federal privacy regimes
- Types and methods of data collection, generation, analysis, storage, and transmission, and plans for re-use, re-distribution, derivative production, archiving, and preservation that reflects the entire data lifecycle in project design
- Efforts made to integrate security and privacy considerations into project design, particularly those that were raised by users, residents, and other stakeholders
- Efforts made to adhere to the following principles:
  - Governance: strong governance frameworks and meaningful resident engagement throughout the lifecycle of projects
  - Ownership and control: avoidance of private-sector ownership and control of publicly-sourced data and community-owned and controlled data approaches
  - Consent: respect for meaningful consent in data collection, use, and disclosure
  - Data minimization and de-identification: pursuit of less privacy-invasive alternatives wherever possible and de-identification of all personal information at the earliest opportunity and mitigation of potential for re-identification
  - Accessibility: accessible, interoperable, and open data approaches to drive community-based solutions
  - Security: secure storage and transmission of data and assurance of effective cybersecurity
- Open and big data strategies, including the ways in which they facilitate transferability and replicability of technologies and projects
- Identification of risks and development of appropriate mitigation strategies
- Other details, as required

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EVALUATION CRITERIA

Plan is detailed, complete, high quality, and well-suited to achievement of outcomes

✓ **10 POINTS**

RUBRIC	
10	Exemplary demonstration with no weaknesses
8	Very good demonstration on virtually all aspects, some weaknesses of modest consequence
6	Reasonably good demonstration on most aspects with some weaknesses that need addressing
4	Some good aspects, some questionable/weak demonstrations that need to be addressed
2	Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
0	No demonstration

Plan supports the implementation of projects

✓ **5 POINTS**

RUBRIC	
5	Exemplary demonstration with no weaknesses
4	Very good demonstration on virtually all aspects, some weaknesses of modest consequence
3	Reasonably good demonstration on most aspects with some weaknesses that need addressing
2	Some good aspects, some questionable/weak demonstrations that need to be addressed
1	Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
0	No demonstration

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Open and big data strategies are employed to the extent possible and facilitate transferability and replicability of technologies and projects

✓ **5 POINTS**

RUBRIC	
5	Exemplary demonstration with no weaknesses
4	Very good demonstration on virtually all aspects, some weaknesses of modest consequence
3	Reasonably good demonstration on most aspects with some weaknesses that need addressing
2	Some good aspects, some questionable/weak demonstrations that need to be addressed
1	Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
0	No demonstration

Risk strategy is thorough and adequately addresses key risks

✓ **5 POINTS**

RUBRIC	
5	Exemplary demonstration with no weaknesses
4	Very good demonstration on virtually all aspects, some weaknesses of modest consequence
3	Reasonably good demonstration on most aspects with some weaknesses that need addressing
2	Some good aspects, some questionable/weak demonstrations that need to be addressed
1	Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
0	No demonstration

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CHAPTER 8: FINANCIAL

✓ **25 POINTS**

REQUIREMENTS

Provide a financial plan for the implementation phase, including:

- Comprehensive project budget with a detailed breakdown of projected revenues, if any, and expenses by year, source, and cost type (including identification of hard and soft as well as direct and indirect costs) that is reasonable, sufficient, and in line with the performance measurement plan
- Methods, sources, and assumptions that result in class B (substantive) estimates of revenues, if any, and expenses at a minimum
- Contributions (financial or in-kind) from other sources, and approach to leverage revenues, if any, and the prize money that amplifies the impact and reach of projects
- Financial tools and accounting methodologies that are appropriate for projects
- Identification of risks and development of appropriate mitigation strategies
- Report on the use of the finalist grant, including reasonable justification of any divergences from the plan laid out in the application
- Other details, as required

EVALUATION CRITERIA

Plan is detailed, complete, high quality, and well-suited to achievement of outcomes

✓ **10 POINTS**

RUBRIC	
10	Exemplary demonstration with no weaknesses
8	Very good demonstration on virtually all aspects, some weaknesses of modest consequence
6	Reasonably good demonstration on most aspects with some weaknesses that need addressing
4	Some good aspects, some questionable/weak demonstrations that need to be addressed
2	Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
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Plan supports the implementation of projects

✓ **5 POINTS**

RUBRIC	
5	Exemplary demonstration with no weaknesses
4	Very good demonstration on virtually all aspects, some weaknesses of modest consequence
3	Reasonably good demonstration on most aspects with some weaknesses that need addressing
2	Some good aspects, some questionable/weak demonstrations that need to be addressed
1	Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
0	No demonstration

Report on the use of the finalist grant is detailed, complete, and demonstrates a rational and effective use for the development of the final proposal and sound management of project funding

✓ **5 POINTS**

RUBRIC	
5	Exemplary demonstration with no weaknesses
4	Very good demonstration on virtually all aspects, some weaknesses of modest consequence
3	Reasonably good demonstration on most aspects with some weaknesses that need addressing
2	Some good aspects, some questionable/weak demonstrations that need to be addressed
1	Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
0	No demonstration

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Risk strategy is thorough and adequately addresses key risks

✓ **5 POINTS**

RUBRIC	
5	Exemplary demonstration with no weaknesses
4	Very good demonstration on virtually all aspects, some weaknesses of modest consequence
3	Reasonably good demonstration on most aspects with some weaknesses that need addressing
2	Some good aspects, some questionable/weak demonstrations that need to be addressed
1	Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
0	No demonstration

CHAPTER 9: IMPLEMENTATION PHASE REQUIREMENTS

✓ **10 POINTS TOTAL**

REQUIREMENTS

This chapter requires you to identify and provide the plans for meeting applicable municipal, provincial, and federal reporting and legislative and policy requirements should you be selected as a winner.

These requirements are:

- Duty to consult with Indigenous groups
- Modern Treaty obligations
- Community Employment Benefit (CEB)
- Climate Lens Assessment (CLA)
- Other applicable laws and regulations and policies, including any cases of change or exemption to legislation and regulations that may apply to projects

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EVALUATION CRITERIA

Plans for meeting relevant municipal, provincial, and federal reporting and legislative requirements are provided and serve as sufficient groundwork for the implementation phase should the finalist be selected as a winner

✓ **5 POINTS**

RUBRIC	
5	Exemplary demonstration with no weaknesses
4	Very good demonstration on virtually all aspects, some weaknesses of modest consequence
3	Reasonably good demonstration on most aspects with some weaknesses that need addressing
2	Some good aspects, some questionable/weak demonstrations that need to be addressed
1	Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
0	No demonstration

Risk strategy is thorough and adequately addresses key risks

✓ **5 POINTS**

RUBRIC	
5	Exemplary demonstration with no weaknesses
4	Very good demonstration on virtually all aspects, some weaknesses of modest consequence
3	Reasonably good demonstration on most aspects with some weaknesses that need addressing
2	Some good aspects, some questionable/weak demonstrations that need to be addressed
1	Several serious weaknesses on crucial aspects and some unsatisfactory demonstrations
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Knecht, Brigit (INFC)

From: Bouchard, Kathleen (INFC)
Sent: March 27, 2019 9:33 AM
To: Railton-King, Meredith (IC)
Cc: Bill, Nicola (IC); Irvine2, Julie (IC); Knecht, Brigit (INFC)
Subject: Smart Cities Final Proposals

Hi Meredith, thanks for following up. We would certainly be interested in any findings your team will come across in your reviews.
While in the short term we are focussed on supporting the jury in their evaluation, we are certainly interested in learning what industry experts such as yourselves are finding.

Let's stay in touch!
Kathleen

From: Railton-King, Meredith (IC)
Sent: March 27, 2019 9:21 AM
To: Bouchard, Kathleen (INFC) <kathleen.bouchard@canada.ca>
Cc: Knecht, Brigit (INFC) <brigit.knecht@canada.ca>; Bill, Nicola (IC) <nicola.bill@canada.ca>; Irvine2, Julie (IC) <julie.irvine2@canada.ca>
Subject: RE: Smart Cities Final Proposals

Kathleen,

Many apologies on the disconnect and the delay in responding. I was under the assumption that comments had been requested from you.

Thanks so much for forwarding the links. We will do a review of the proposals regardless of a formal request. As we have discussed previously, 'smart cities' touches on a number of files our branch works on including: connected and automated vehicles, zero-emission vehicles, cybersecurity, 5G, artificial intelligence, and shared mobility.

Should we have any comments of note, do you want us to forward these to you as a courtesy?

Meredith

Meredith Railton-King
Senior Policy Analyst, Automotive, Transportation and Digital Technology Branch
Innovation, Science and Economic Development Canada / Government of Canada
meredith.railton-king@canada.ca / Tel: 519-572-4137 / TTY: 1-866-694-8389

Analyste principle de politiques, Direction generale de l'automobile, du transport et des technologies numeriques
Innovation, Sciences et Développement économique Canada / Gouvernement du Canada
meredith.railton-king@canada.ca / Tél. : 519-572-4137 / ATS : 1-866-694-8389

From: Bouchard, Kathleen (INFC) <kathleen.bouchard@canada.ca>
Sent: March 25, 2019 3:34 PM

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To: Railton-King, Meredith (IC) <meredith.railton-king@canada.ca>
Cc: Knecht, Brigit (INFC) <brigit.knecht@canada.ca>
Subject: Smart Cities Final Proposals

Hi Meredith, all the applications can be found online as the finalists posted them on their websites (as well as short videos).

At this time Infrastructure Canada is not seeking revisions or assessments from other departments so we don't have any timelines to provide on that side. Attached, you will find our consolidation of weblinks that will take you to each of the 20 final proposals for you own interest ☺

Feel free to give me a ring if you have any questions.

Kathleen
613-960-5659

From: Railton-King, Meredith (IC)
Sent: March 25, 2019 12:12 PM
To: Bouchard, Kathleen (INFC) <kathleen.bouchard@canada.ca>
Subject: FW: sommaire des finalistes

Kathleen,

I have been asked by my Director General to review the Smart Cities Challenge Fund applications from an automotive perspective and to provide comments. I was told that the best source of information on the applications was look at the applicant websites. Is there a more formalized process for locating the applicant information. I know previously there was a portal that we were provided access too as part of the initial review process.

Any help you could provide along with applicable deadlines would be sincerely appreciated.

Meredith

From: Bouchard, Kathleen (INFC) <kathleen.bouchard@canada.ca>
Sent: March 25, 2019 9:56 AM
To: Goodman, Claude (IC) <claude.goodman@canada.ca>
Subject: FW: sommaire des finalistes

Bonjour Claude, merci beaucoup de partagé votre analyse révélatrice avec nous. Ce sera très intéressant de voir comment les communautés iront de l'avant pour faire avancer leurs projets.
Les prochains mois dévoileront sans doutes d'autres informations intéressante en lien avec la mise en œuvre de projets innovateurs entre autres le fonctionnement de la gouvernance et l'application ententes de contribution basés sur la performance etc...

En ce qui a trait à la prochaine étape des évaluations, compte tenu de la quantité de détails et l'ampleur des propositions finales, nous avons fait appel à une firme externe pour aider avec les analyses. (Raymond Chabot Grant Thornton).

En passant... l'annonce des gagnants aura lieu lors d'un évènement, le 14 mai au Centre National des arts. Notre sous-ministre communiquera sous peu avec les autres départements pour les invitations ☺ Je te tiens au courant.

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From: Goodman, Claude (IC)
Sent: March 21, 2019 2:42 PM
To: Bouchard, Kathleen (INFC) <kathleen.bouchard@canada.ca>
Subject: sommaire des finalistes

Bonjour Kathleen,

Je te fais suivre à titre d'intérêt, une copie du sommaire (pour notre utilisation interne) des technologies et des partenaires qui ont été soulevés dans les propositions finales des participants du Défi des villes intelligentes. J'observe que la majorité des technologies citées par les participants sont celles reliées à L'internet des choses (IoT), l'intelligence artificielle (AI) et le « big data ». Étonnamment, il y a peu d'entreprises canadiennes œuvrant dans ces domaines qui sont identifiés comme partenaires!

Aussi, comptez-vous avoir recours des évaluateurs externes pour les prochaines étapes?

Salutations,

Claude

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ATIA - 20(1)(b)

ATIA - 21(1)(b)

Cardinal2, Patrick (INFC)

From: Long, Alexander (INFC)
Sent: March 29, 2019 1:12 PM
To: Poirier2, Eric (INFC)
Cc: Tremblay, Jenny (INFC)
Subject: RE: FOR CONSULTATION: Climate Lens Assessment Plans - Richmond Final Proposal

Got it – thanks.

From: Poirier2, Eric (INFC)
Sent: March 29, 2019 1:04 PM
To: Long, Alexander (INFC) <alexander.long@canada.ca>
Cc: Tremblay, Jenny (INFC) <jenny.tremblay@canada.ca>
Subject: Fwd: FOR CONSULTATION: Climate Lens Assessment Plans - Richmond Final Proposal

For the Richmond review.

EP

Sent from my iPhone

Begin forwarded message:

> **From:** "Nelson, Chad (INFC)" <chad.nelson@canada.ca>
> **Date:** March 29, 2019 at 12:59:27 PM EDT
> **To:** "Poirier2, Eric (INFC)" <eric.poirier2@canada.ca>
> **Cc:** "Judge, Robert (INFC)" <robert.judge@canada.ca>, Lemieux3, Stéphanie (INFC) <stephanie.lemieux3@canada.ca>, "Smith2, Sean (INFC)" <sean.smith2@canada.ca>
> **Subject: FW: FOR CONSULTATION: Climate Lens Assessment Plans - Richmond Final Proposal**
>
> Hi Eric,
>
> In reviewing the City of Richmond's plans to address the Climate Lens requirements, [redacted]
>
> A few small notes:
>
> 1. [redacted]
> 2.
> 3.

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[redacted]

If helpful or needed, please feel free to have one of your colleagues contact, Sean Smith (cc'd), here in Sectoral Policy, should there be additional questions.

Chad

ATIA - 21(1)(b)

ATIA - 20(1)(b)

From: Williams, Tushara (INFC)
Sent: Tuesday, March 26, 2019 11:37 AM
To: Judge, Robert (INFC) <robert.judge@canada.ca>; Nelson, Chad (INFC) <chad.nelson@canada.ca>
Cc: Poirier2, Eric (INFC) <eric.poirier2@canada.ca>
Subject: FW: FOR CONSULTATION: Climate Lens Assessment Plans - Richmond Final Proposal

Robert and Chad
Please could you take a look and get back to Eric with any questions you have?
Thanks in advance for your help
Tushara

From: Poirier2, Eric (INFC)
Sent: March 26, 2019 9:20 AM
To: Williams, Tushara (INFC) <tushara.williams@canada.ca>
Cc: Tremblay, Jenny (INFC) <jenny.tremblay@canada.ca>; Courval, Manon (INFC) <manon.courval@canada.ca>; Long, Alexander (INFC) <alexander.long@canada.ca>; Fletcher-Kyle, Ashley (INFC) <ashley.fletcher-kyle@canada.ca>
Subject: FOR CONSULTATION: Climate Lens Assessment Plans - Richmond Final Proposal

Bonjour Tushara,

As Jenny mentioned at a recent Branch management meeting, there may be a few Smart Cities Challenge final proposals that require the view of policy experts within INFC or beyond to assist in our review process in support of the Smart Cities Challenge Jury.

The Richmond project is within the scope of application of the Climate Lens Assesment process and they have identified in their final proposal their plans to meet their obligations in this regard. Could your CLA folks have a look and give us some feedback about how this lines up with INFC expectations on a CLA?

We have attached the following:

- Richmond Final Proposal section on CLA for review
- Webinar presentation used to explain obligations to finalists for reference (pages 8-12, specifically)
- Finalist Guide excerpt (criteria relevant to CLA are in Chapter 9) for reference
- The full final proposal is online

Any written views would be most welcome by noon on Friday (if at all possible). We would also be happy to meet with your folks to talk this through.

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Au plaisir,
EP

Eric Poirier

Directeur principal, Défi des villes intelligentes
Infrastructure Canada / Gouvernement du Canada
eric.poirier2@canada.ca / Tél: 613-957-2460 (nouveau!)

Senior Director, Smart Cities Challenge
Infrastructure Canada / Government of Canada
eric.poirier2@canada.ca / Tel: 613-957-2460 (new!)

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ATIA - 20(1)(b)
ATIA - 21(1)(b)

Beute, Shantel (INFC)

From: Long, Alexander (INFC)
Sent: March 29, 2019 1:12 PM
To: Hwang, Susan (INFC)
Subject: FW: FOR CONSULTATION: Climate Lens Assessment Plans - Richmond Final Proposal

FYI

From: Poirier2, Eric (INFC)
Sent: March 29, 2019 1:04 PM
To: Long, Alexander (INFC) <alexander.long@canada.ca>
Cc: Tremblay, Jenny (INFC) <jenny.tremblay@canada.ca>
Subject: Fwd: FOR CONSULTATION: Climate Lens Assessment Plans - Richmond Final Proposal

For the Richmond review.

EP

Sent from my iPhone

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> **Cc:** "Judge, Robert (INFC)" <robert.judge@canada.ca>, Lemieux3, Stéphanie (INFC) <stephanie.lemieux3@canada.ca>, "Smith2, Sean (INFC)" <sean.smith2@canada.ca>
> **Subject: FW: FOR CONSULTATION: Climate Lens Assessment Plans - Richmond Final Proposal**
>
> Hi Eric,
>
> In reviewing the City of Richmond's plans to address the Climate Lens requirements, [redacted]
>
> [redacted]
>
> A few small notes:
>
> 1. [redacted]
> 2.
> 3.

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[redacted]

If helpful or needed, please feel free to have one of your colleagues contact, Sean Smith (cc'd), here in Sectoral Policy, should there be additional questions.

Chad

From: Williams, Tushara (INFC)
Sent: Tuesday, March 26, 2019 11:37 AM
To: Judge, Robert (INFC) <robert.judge@canada.ca>; Nelson, Chad (INFC) <chad.nelson@canada.ca>
Cc: Poirier2, Eric (INFC) <eric.poirier2@canada.ca>
Subject: FW: FOR CONSULTATION: Climate Lens Assessment Plans - Richmond Final Proposal

Robert and Chad
Please could you take a look and get back to Eric with any questions you have?
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From: Poirier2, Eric (INFC)
Sent: March 26, 2019 9:20 AM
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Cc: Tremblay, Jenny (INFC) <jenny.tremblay@canada.ca>; Courval, Manon (INFC) <manon.courval@canada.ca>; Long, Alexander (INFC) <alexander.long@canada.ca>; Fletcher-Kyle, Ashley (INFC) <ashley.fletcher-kyle@canada.ca>
Subject: FOR CONSULTATION: Climate Lens Assessment Plans - Richmond Final Proposal

Bonjour Tushara,

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Au plaisir,
EP

Eric Poirier

Directeur principal, Défi des villes intelligentes
Infrastructure Canada / Gouvernement du Canada
eric.poirier2@canada.ca / Tél: 613-957-2460 (nouveau!)

Senior Director, Smart Cities Challenge
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eric.poirier2@canada.ca / Tel: 613-957-2460 (new!)

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ATIA - 20(1)(b)
ATIA - 21(1)(b)

Poirier2, Eric (INFC)

From: Poirier2, Eric (INFC)
Sent: March 29, 2019 1:04 PM
To: Nelson, Chad (INFC)
Cc: Judge, Robert (INFC); Lemieux3, Stéphanie (INFC); Smith2, Sean (INFC)
Subject: Re: FOR CONSULTATION: Climate Lens Assessment Plans - Richmond Final Proposal

Bonjour Chad,

Thank you so much for this and for taking the time to help out in our review process.

Have a wonderful weekend,
EP

Sent from my iPhone

On Mar 29, 2019, at 12:59 PM, Nelson, Chad (INFC) <chad.nelson@canada.ca> wrote:

> Hi Eric,
>
> In reviewing the City of Richmond's plans to address the Climate Lens requirements, [redacted]
>
> A few small notes:
>
> 1. [redacted]
> 2.
> 3.
>
> If helpful or needed, please feel free to have one of your colleagues contact, Sean Smith (cc'd), here in Sectoral Policy, should there be additional questions.
>
> Chad
>
> **From:** Williams, Tushara (INFC)
> **Sent:** Tuesday, March 26, 2019 11:37 AM
> **To:** Judge, Robert (INFC) <robert.judge@canada.ca>; Nelson, Chad (INFC) <chad.nelson@canada.ca>

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Cc: Poirier2, Eric (INFC) <eric.poirier2@canada.ca>
Subject: FW: FOR CONSULTATION: Climate Lens Assessment Plans - Richmond Final Proposal

Robert and Chad
Please could you take a look and get back to Eric with any questions you have?
Thanks in advance for your help
Tushara

From: Poirier2, Eric (INFC)
Sent: March 26, 2019 9:20 AM
To: Williams, Tushara (INFC) <tushara.williams@canada.ca>
Cc: Tremblay, Jenny (INFC) <jenny.tremblay@canada.ca>; Courval, Manon (INFC) <manon.courval@canada.ca>; Long, Alexander (INFC) <alexander.long@canada.ca>; Fletcher-Kyle, Ashley (INFC) <ashley.fletcher-kyle@canada.ca>
Subject: FOR CONSULTATION: Climate Lens Assessment Plans - Richmond Final Proposal

Bonjour Tushara,

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- The full final proposal is online

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Au plaisir,
EP

Eric Poirier

Directeur principal, Défi des villes intelligentes
Infrastructure Canada / Gouvernement du Canada
eric.poirier2@canada.ca / Tél: 613-957-2460 (nouveau!)

Senior Director, Smart Cities Challenge
Infrastructure Canada / Government of Canada
eric.poirier2@canada.ca / Tel: 613-957-2460 (new!)

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ATIA - 19(1) ATIA - 21(1)(b)

ATIA - 20(1)(b)

Poirier2, Eric (INFC)

From: Long, Alexander (INFC)
Sent: April 1, 2019 3:00 PM
To: Poirier2, Eric (INFC)
Subject: FW: FOR CONSULTATION: Climate Lens Assessment Plans - Richmond Final Proposal

FYI – further analysis from our colleagues to file.

From: Smith2, Sean (INFC)
Sent: April 1, 2019 11:27 AM
To: Nelson, Chad (INFC) <chad.nelson@canada.ca>; Long, Alexander (INFC) <alexander.long@canada.ca>
Subject: RE: FOR CONSULTATION: Climate Lens Assessment Plans - Richmond Final Proposal

Hi Alex,

[redacted]

Sean Smith
Infrastructure Canada | www.infrastructure.gc.ca
sean.smith2@canada.ca 613-960-9628

From: Nelson, Chad (INFC)
Sent: March 29, 2019 4:58 PM
To: Long, Alexander (INFC) <alexander.long@canada.ca>
Cc: Smith2, Sean (INFC) <sean.smith2@canada.ca>
Subject: RE: FOR CONSULTATION: Climate Lens Assessment Plans - Richmond Final Proposal

Hi Alex,

[redacted] my colleague, Sean (cc'd) can take a look.

Have a great weekend as well,

Chad

From: Long, Alexander (INFC)
Sent: Friday, March 29, 2019 4:34 PM
To: Nelson, Chad (INFC) <chad.nelson@canada.ca>
Subject: FW: FOR CONSULTATION: Climate Lens Assessment Plans - Richmond Final Proposal

Processed under the provisions of the Access to Information Act /Révisé en vertu de la Loi sur l'accés à l'information

ATIA - 21(1)(b)

ATIA - 20(1)(b)

Hi Chad,

Thanks for your assessment of Richmond's plans re climate lens assessment. Unfortunately the online version does not contain the appendices. I've attached the CLA referenced in the proposal and contained in the appendix. This would address your second point and perhaps your third. Could you take a quick look and let me know if you see any concerns and/or gaps in the assessment?

Thanks – and have a great weekend!

Alex

From: Poirier2, Eric (INFC)
Sent: March 29, 2019 1:04 PM
To: Long, Alexander (INFC) <alexander.long@canada.ca>
Cc: Tremblay, Jenny (INFC) <jenny.tremblay@canada.ca>
Subject: Fwd: FOR CONSULTATION: Climate Lens Assessment Plans - Richmond Final Proposal

For the Richmond review.

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> **Cc:** "Judge, Robert (INFC)" <robert.judge@canada.ca>, Lemieux3, Stéphanie (INFC) <stephanie.lemieux3@canada.ca>, "Smith2, Sean (INFC)" <sean.smith2@canada.ca>
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>
> A few small notes:
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> 1. [redacted]
> 2.
> 3.

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ATIA - 21(1)(b)

[redacted]

ATIA - 20(1)(b)

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Chad

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To: Judge, Robert (INFC) <robert.judge@canada.ca>; Nelson, Chad (INFC) <chad.nelson@canada.ca>
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Au plaisir,
EP

Eric Poirier

Directeur principal, Défi des villes intelligentes
Infrastructure Canada / Gouvernement du Canada
eric.poirier2@canada.ca / Tél: 613-957-2460 (nouveau!)

Senior Director, Smart Cities Challenge
Infrastructure Canada / Government of Canada
eric.poirier2@canada.ca / Tel: 613-957-2460 (new!)

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Poirier2, Eric (INFC)

From: Tremblay, Jenny (INFC)
Sent: April 2, 2019 10:29 AM
To: Peets, Gerard (INFC); Wronski, Michael (INFC); Baalbaki2, Fatima (INFC); Eyre, Jennifer (INFC); Chan, Jeanna (INFC)
Cc: Doucet, Antoine (INFC); Allaire, Lisa (INFC); Poirier2, Eric (INFC); Knecht, Brigit (INFC)
Subject: Cote St Luc in the news re Smart Cities

Check out this video of Cote St Luc on CTV Montreal yesterday, talking about their Smart Cities Challenge proposal. It's a long and very well-produced segment! May be worth flipping to MINO, if they haven't already seen.

https://globalnews.ca/video/5118030/cote-saint-luc-could-win-smart-cities-challenge

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Cardinal2, Patrick (INFC)

From: Tremblay, Jenny (INFC)
Sent: April 2, 2019 1:56 PM
To: Doucet, Antoine (INFC); INFC.O PR.ADMO.Users / Utilisateurs.PR.BSMA O.INFC
Cc: INFC.O PR.SCCD.DGO.Users / Utilisateurs.PR.DDVI.BDG O.INFC
Subject: RE: 50651 - Review and evaluation process of Smart Cities Challenge

Bonjour ADMO colleagues,

Please see the answer below to the Deputy's question.

Cheers,

Jenny
****

The points-based criteria and guide used by the Smart Cities Challenge Jury to evaluate the final proposals are public and can be found in Appendix 4 (pg. 34-53) of the Finalist Guide (please see https://impact.canada.ca/en/challenges/smart-cities/finalist-guide).

While a dedicated document that explains the step-by-step stages of the evaluation process is not public, a description of the core approach is publicly available. The Impact Canada website (please see https://impact.canada.ca/en/challenges/smart-cities/process) explains that final proposals will be reviewed by experts and then evaluated by the Smart Cities Challenge Jury. Evaluations will focus on project feasibility, strength of the business case, and clear links to the outcomes established in the Challenge Statement, with the Jury helping to select winners by Spring 2019.

The Finalists were provided with more detailed information via the final finalist FAQ communication prior to the deadline. This included information on the external expert reviews (Raymond Chabot Grant Thornton contract), the process/timing for the Jury to ask questions to finalists, the individual work of Jury members as well as the fact that there would be two in-person Jury deliberations.

From: Doucet, Antoine (INFC)
Sent: April 2, 2019 8:55 AM
To: INFC.O PR.SCCD.DGO.Users / Utilisateurs.PR.DDVI.BDG O.INFC <infc.pr.sccd.dgo.users-utilisateurs.pr.ddvi.bdg.infc@canada.ca>
Cc: INFC.O PR.ADMO.Users / Utilisateurs.PR.BSMA O.INFC <infc.pr.admo.users-utilisateurs.pr.bsma.infc@canada.ca>
Subject: FW: 50651 - Review and evaluation process of Smart Cities Challenge
Importance: High

Bonjour,

Sorry we missed this one.

Can you provide an answer to the deputy's question below?

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Merci,
Antoine Doucet
613-948-9309

From: Hassan, Samira (INFC)
Sent: March 28, 2019 11:08 AM
To: INFC.O PR.ADMO.Users / Utilisateurs.PR.BSMA O.INFC <infc.pr.admo.users-utilisateurs.pr.bsma.infc@canada.ca>
Cc: INFC.F DM Office / Bureau du SM F.INFC <infc.dmoffice-bureaudusm.infc@canada.ca>
Subject: 50651 - Review and evaluation process of Smart Cities Challenge

Hello Policy,

The DM reviewed this docket and approves of the content. She had a question which can be answered via reply to this email.

> "Good work. Is the process and evaluation guide public?"

Thank you,

Samira Hassan
A/ Correspondence Officer | Agente à la correspondance p.i.
Deputy Minister's Office | Bureau du sous-ministre
Infrastructure Canada
613-941-7502 | 343-548-6709

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Infrastructure Canada

PROTECTED A

BRIEFING NOTE TO THE DEPUTY MINISTER

SMART CITIES CHALLENGE FINAL PROPOSAL EVALUATION/REVIEW PROCESS

(For Information)

good work to the process + evaluation guide public =)

PURPOSE

- This note provides an overview of the evaluation/review process for the Smart Cities Challenge final proposals (**Annexes A and B**), and outlines considerations and next steps as we move toward the selection of winners and their announcement on May 14, 2019.

HIGHLIGHTS/KEY CONSIDERATIONS

- All final proposals (20) were received on March 5, 2019. To ensure appropriate support to the Smart Cities Challenge Jury, the Smart Cities Challenge Directorate is coordinating technical reviews of these proposals. On parallel tracks, in-depth technical reviews are being undertaken by a contracted external firm (Raymond Chabot Grant Thornton) as well as by the Smart Cities Challenge Directorate in consultation with experts within Infrastructure Canada (INFC) and from other government departments, as required.

- These reviews will result in the creation of support packages for the independent Jury, who will meet to deliberate on two occasions (April 23-24 and May 2-3, 2019) to produce, through consensus, a recommended slate of winners for consideration by the Minister. The purpose of INFC's internal and external review process is not to fully evaluate or rank the merit of the final proposals. The purpose is to provide the Jury and ultimately the Minister with comprehensive and considered summaries of the key strengths and weaknesses of the submissions so that they may take this information into account during their deliberations.

- It is hoped that the Minister could meet with the Jury during one of these deliberation days to thank the members for their service and present them each with an acknowledgement gift.

- The Jury's task is to consider each final proposal against the evaluation criteria published in the Finalist Guide (**Annex C**). At the end of the process, the Jury will reach a consensus score for each of the final proposals. Each finalist will be provided their score in private.

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Hwang, Susan (INFC)

From: Long, Alexander (INFC)
Sent: April 2, 2019 5:01 PM
To: Poirier2, Eric (INFC); Sirna, Josie (INFC); Baird, Matthew (INFC); Bouchard, Kathleen (INFC); Aizlewood, Amanda (INFC); Hwang, Susan (INFC)
Cc: Fletcher-Kyle, Ashley (INFC)
Subject: RE: draft ROD -

Hi Eric,

At this point, as we discussed at our last meeting, it might make sense for each assessment team to do a final review of their assessments (e.g. neutral language, not using superlatives), and then have a different team with fresh eyes do a high-level review and suggest any changes/revisions. Depending on people's bandwidth, Susan and I could probably get the $10M review done by Thursday for another team to review by early next week. Would be good to know others' ability to do the final review of their own proposals and make time to review another set of proposals.

Alex

From: Poirier2, Eric (INFC)
Sent: April 2, 2019 2:25 PM
To: Sirna, Josie (INFC) <josie.sirna@canada.ca>; Long, Alexander (INFC) <alexander.long@canada.ca>; Baird, Matthew (INFC) <matthew.baird@canada.ca>; Bouchard, Kathleen (INFC) <kathleen.bouchard@canada.ca>; Aizlewood, Amanda (INFC) <amanda.aizlewood@canada.ca>; Hwang, Susan (INFC) <susan.hwang@canada.ca>
Cc: Fletcher-Kyle, Ashley (INFC) <ashley.fletcher-kyle@canada.ca>
Subject: RE: draft ROD -

Hallo,

I made some adjustments to the ROD from my perspective. Have a look and we can formally approve at the next meeting.

Do we have a draft ROD for the second meeting yet? When should plan for the next meeting?

EP

From: Sirna, Josie (INFC)
Sent: March 27, 2019 4:26 PM
To: Poirier2, Eric (INFC) <eric.poirier2@canada.ca>; Long, Alexander (INFC) <alexander.long@canada.ca>; Baird, Matthew (INFC) <matthew.baird@canada.ca>; Bouchard, Kathleen (INFC) <kathleen.bouchard@canada.ca>; Aizlewood, Amanda (INFC) <amanda.aizlewood@canada.ca>; Hwang, Susan (INFC) <susan.hwang@canada.ca>
Cc: Fletcher-Kyle, Ashley (INFC) <ashley.fletcher-kyle@canada.ca>
Subject: draft ROD - does this meet our needs?

Hi Colleagues,
Here is a link to the draft ROD of our review committee meeting. Does this suit our needs? Modifications welcome.
Josie.

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Beute, Shantel (INFC)

From: Long, Alexander (INFC)
Sent: April 10, 2019 3:47 PM
To: Beute, Shantel (INFC)
Subject: FW: Finalist Proposal Assessment – Update and Logistics
Attachments: Final Smart Cities Challenge proposals available for download

From: Tremblay, Jenny (INFC)
Sent: March 20, 2019 9:34 PM
To: [redacted]

Cc: Poirier2, Eric (INFC) <eric.poirier2@canada.ca>; McKenzie, Vicki (INFC) <vicki.mckenzie@canada.ca>; Long, Alexander (INFC) <alexander.long@canada.ca>; Hwang, Susan (INFC) <susan.hwang@canada.ca>; Bouchard, Kathleen (INFC) <kathleen.bouchard@canada.ca>
Subject: Finalist Proposal Assessment – Update and Logistics

Dear Jury Members:

As we've in the midst of our internal and third party expert assessment of the final proposals, I wanted to make sure that you're able to access the final proposals on Central Collab. If you haven't yet had a chance to view the proposals, the instructions for accessing them can be found in my e-mail of March 7 (attached). And if you're having any difficulties in accessing the proposals, please let me know and my team will get back to you to resolve any issues.

Otherwise, my team will be contacting you shortly on a few matters:

- Working with you to look for convenient dates/times for your smaller working group conference call(s).

- Booking travel! Our colleague Vicki McKenzie (vicki.mckenzie@canada.ca) will reach out to arrange your travel. It would greatly help us at Infrastructure Canada if we could make as many bookings as possible before March 31, 2019.

- Updating your online profiles to reflect any required changes. Alex Long (alexander.long@canada.ca) is your contact for this.

As always, let me know if you have any questions or concerns.

Regards,
Jenny

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Beute, Shantel (INFC)

From: Tremblay, Jenny (INFC)
Sent: March 7, 2019 2:05 PM
To: [redacted]
Cc: Bouchard, Kathleen (INFC); Poirier2, Eric (INFC); Cardinal2, Patrick (INFC); McKenzie, Vicki (INFC)
Subject: Final Smart Cities Challenge proposals available for download

Dear Smart Cities Jury Members,

As the Secretary to the Jury, it is my pleasure and privilege to let you know that the Smart Cites Challenge Finalist Proposals and tools for your evaluation are now accessible on Central Collab. As we mentioned on the call last week, the sharing platform now allows you to download all materials at once rather than individually. Instructions on accessing Central Collab and a description of the content available follow at the end of this message.

A few reminders:

- **Confidential info:** Please be mindful of the sensitive nature of some of the content. We tagged confidential components with "CONF" to denote their careful treatment due to privacy analyses, confidential commercial or other sensitive information entrusted to us by finalists and/or partners.
- **Discretion:** A respectful reminder of the need to be discrete and secretive about your notes, views, comments, etc., other than with your Jury colleagues and the INFC Secretariat supporting you.
- **Fairness:** While documents from finalists proposals are starting to be posted by finalists, please only evaluate the versions provided by INFC in case finalists make modifications or add information for the benefit of their residents.
- **Support:** The team will be reaching out to you in the next week to start finding time for working group discussions that may work for you.
- **Travel:** please do not hesitate to contact Vicki McKenzie on our team to help you book deliberation travel. The sooner booked, the better travel choices will be available to you.
- **Information to come:** Translations of two final proposals are expected by March 18. We will also circulate by email the links to the finalist videos once they are all on the finalists' websites.

I look forward to continuing to support you in your important task,

Jenny Tremblay

****

HOW TO ACCESS

Step 1: Accessing the proposals:

- Sign in to Central Collab
- If you don't remember your login info click on FORGOT YOUR PASSWORD OR USERNAME
- If you have any issues, contact Kathleen Bouchard through email or at (613)790-1838.

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Step 2: Downloading the files

[redacted]

ATIA - 16(2)

Step 3: Unzipping the Final Proposals

- Once saved onto your computer, you may have to unzip the folder to access the files.
  - MacOS: The file should automatically be unzipped into the same folder when you open it.
  - Microsoft Windows 10: Select the zipped folder and the "Compressed Folder Tools" should appear above. Select "Extract all" to unzip the files.



  - Microsoft Windows 7/8: Right-click the zipped folder and select "Extract All..." to unzip the files.
  -
  - If you are not running on the above operating systems, you may need to download an appropriate software, such as WinZIP.

Content:

20 Finalist sub-folders, each containing files specific to a finalist. You will notice that not all finalists have items under #2 and #4, these were not a requirement.

1. Finalist Proposal
2. Letters of support
3. Privacy Impact Assessments
4. Confidential Annex

- Jury Evaluation Grid.xslx for early scoring and comments (instruction and assignments in tabs)
- Process and Calendar
- Priority Assignment List
- Finalist Guide (English and French)

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ATIA - 19(1)

Beute, Shantel (INFC)

From: Long, Alexander (INFC)
Sent: April 10, 2019 4:04 PM
To: Beute, Shantel (INFC)
Subject: FW: Nunavut Proposal Follow-up

From: Long, Alexander (INFC)
Sent: March 18, 2019 5:31 PM
To: [redacted]
Subject: RE: Nunavut Proposal Follow-up

Hi [redacted]

[redacted] The executive summary was good for our purposes and will be on the Nunavut profile on the INFC website. You can certainly use the revised version of your proposal on your own website and for your own communications purposes. INFC can only use the version you submitted prior to the submission deadline, but this will not be posted online – it is just for internal review.

Let me know if you have any questions,

Alex

From: [redacted]
Sent: March 18, 2019 1:02 PM
To: Long, Alexander (INFC) <alexander.long@canada.ca>
Subject: Re: Nunavut Proposal Follow-up

Hi Alex,

[redacted]

Just wondering if this summary was ok for your purposes? Do you need it any other format?
I have incorporated it into the full proposal and attached it here, in case you wanted a revised copy for public use. I also fixed some formatting errors and a typo or two. This attachment does not contain letters of support, so it wouldn't be appropriate for the jury (and I know that we are not allowed to add or edit anything for their purposes), but this would be a neater document for public display, and it is the one on our website now. You do not need to use it if you don't want to/against protocol - but let me know if there are any issues in us having this one on our website?

Thanks.

[redacted]

On Thu, Mar 14, 2019 at 9:46 AM Long, Alexander (INFC) <alexander.long@canada.ca> wrote:

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Thanks [redacted]

Alex

From: [redacted]
Sent: March 14, 2019 9:02 AM
To: Long, Alexander (INFC) <alexander.long@canada.ca>; [redacted]
Subject: Re: Nunavut Proposal Follow-up

Hi Alex,

Attached is the Executive Summary as a 2 page pdf.

If there are any issues please let me know. I will be limited in my availability today but will get back to you asap.

Thanks again for the opportunity to get this to you.

All the best,

[redacted]

On Mon, Mar 11, 2019 at 2:56 PM Long, Alexander (INFC) <alexander.long@canada.ca> wrote:

> Hi [redacted]
>
> Feel free to call me at 613-957-7304 or send me a number I can reach you at.
>
> Alex

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ATIA - 19(1)

From: [redacted]
Sent: March 11, 2019 2:52 PM
To: Long, Alexander (INFC) <alexander.long@canada.ca>
Subject: Re: Nunavut Proposal Follow-up

Hi Alex,

I could be available in ten minutes. Por tomorrow morning? What works for you?

Thanks,

[redacted]

On Mon, Mar 11, 2019, 1:28 PM Long, Alexander (INFC), <alexander.long@canada.ca> wrote:

Hi [redacted]

I hope you're doing well [redacted] I have a question regarding your proposal. Could you let me know if you're available for a quick call this afternoon or tomorrow?

Thanks,

Alex

Alex Long

Senior Advisor | Conseiller principal

Smart Cities Challenge | Défi des villes intelligentes

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Infrastructure Canada

Alexander.Long@canada.ca | T : 613-957-7304 | M [redacted]

ATIA - 19(1)

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[redacted] **Pinnguaq Association**

www.pinnguaq.com

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[redacted] **Pinnguaq Association**

www.pinnguaq.com

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Beute, Shantel (INFC)

From: Long, Alexander (INFC)
Sent: April 10, 2019 4:22 PM
To: Beute, Shantel (INFC)
Subject: FW: Late Letter of Support

From: Long, Alexander (INFC)
Sent: March 5, 2019 3:11 PM
To: 'Leon de Vreede' <Leon.deVreede@bridgewater.ca>
Subject: RE: Late Letter of Support

Hi Leon,

We won't be accepting any materials after today's submission deadline. You could just provide an e-mail from the partner organization confirming their support or if you're confident you'll receive the letter later today/evening, you could send your core proposal this afternoon with an e-mail saying your appendix with support letters will follow – as long as we receive it before 23:59 PST!

Alex

From: Leon de Vreede [mailto:Leon.deVreede@bridgewater.ca]
Sent: March 5, 2019 3:02 PM
To: Long, Alexander (INFC) <alexander.long@canada.ca>
Subject: Late Letter of Support

Hi Alex,
We are still missing one letter of support that was promised to us by last week but that we still haven't received – it's been held up within the partner organization, though we've been assured that we will be receiving it. Would it be possible to deliver that missing letter to SCC when we receive it later this week? Our only alternative is to remove all references to it in our application.
Thanks,
Leon

Leon de Vreede, MCIP, LPP
Sustainability Planner
Planning Department

town of BRIDGEWATER

T: 902-541-4390
F: 902-543-6876
E: Leon.deVreede@bridgewater.ca

60 Pleasant Street

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Bridgewater, NS B4V 3X9

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Beute, Shantel (INFC)

From: Long, Alexander (INFC)
Sent: April 10, 2019 4:22 PM
To: Beute, Shantel (INFC)
Subject: FW: Smart Cities Video Transcript

From: Long, Alexander (INFC)
Sent: March 5, 2019 10:11 AM
To: 'Leon de Vreede' <Leon.deVreede@bridgewater.ca>
Subject: RE: Smart Cities Video Transcript

Hi Leon,

I'm not in a position to provide this kind of advice at this point. That said, remember the transcript is not evaluated – if information is missing, our Comms team will follow up with you after submission.

Alex

From: Leon de Vreede [mailto:Leon.deVreede@bridgewater.ca]
Sent: March 5, 2019 9:42 AM
To: Long, Alexander (INFC) <alexander.long@canada.ca>
Subject: Smart Cities Video Transcript

Hi Alex,
Following up on the video itself, please see attached the video transcript. Our video production company has never done this before and so we just want some assurance that this is essentially what the guide is asking for, as it seems to be an unusual combination of transcript plus visual descriptions which they've never been asked to produce before.

Are you able to advise on this point? Again, this is not about content, just making sure we are clear on what the requirements are.

They can still make any necessary changes today.

Thanks,
Leon

Leon de Vreede, MCIP, LPP
Sustainability Planner
Planning Department

town of BRIDGEWATER

T: 902-541-4390
F: 902-543-6876

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Page(s) 340 to 342
are withheld
pursuant to paragraph
13(1)(d) & 20(1)(b)
of the *Access to Information Act*

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La/les page(s) 340 à 342
Font l'objet d'une exception totale
conformément aux dispositions de paragraphe
13(1)(d) & 20(1)(b)
de la *loi sur l'accès à l'information*

Waiting from PC

* aim to comply w/ ATIPP + PIPEDA laws PPIA

- **Katinnganiq: Commuity, Connectivty, and Digital Access for Life Promotion in Nunavut**

1) Description of the Initiative: Provide a summary of the program, project activity or system, describe its purposes, goals and objectives. Explain the need for the new program, project or system and its benefits.

The *Katinnganiq: Community, Connectivity, and Digital Access for Life Promotion in Nunavut* is a proposal being submitted to the Smart Cities Challenge competition by the Nunavut Association of Municipalities (in collaboration with Pinnguaq Association, Embrace Life Council, and Qaujigiartiit Health Research Centre) on behalf of the 25 municipalities of Nunavut. The goal of the proposal is to implement protective and preventative measures to reduce the risk of suicide in Nunavut, which is ten times the national average, and increase the amount and accessibility of peer support networks, educational resources and creative outlets that promote positive Mental Health to all Nunavummiut.

Our goal to promote life and positive mental health for young Nunavummiut is sought by increasing protective factors and contributing to social equity through community makerspaces that nurture wellbeing while addressing the digital divide in the North. As articulated in our challenge statement, we seek to increase the availability and accessibility of life promoting activities, resources and support systems like peer networks, educational initiatives and creative outlets to all Nunavummiut in the expanded field of data and technology.

The purpose of the Makerspaces initiative is to build youth resilience to embrace the future with confidence, armed with new coping skills and tools, and supported by positive relationships. The central focus of Makerspaces is on 'protective factors', where youth will build a personal sense of belonging, meaning, purpose and hope through their participation in activities. This initiative will provide safe, nurturing, welcoming social hubs for Nunavummiut that:

- **Provide imaginative and engaging programs:** including recreational, extra-curricular learning and skills acquisition (leadership, technology, interpersonal), the arts (performance, visual, music), traditional cultural/ language activities, peer mentoring, Elder mentoring, and coaching.

- **Leverage digital connectivity** where youth have opportunities to connect within communities and across Nunavut's 25 hamlets, share knowledge with each other and express themselves through access to digital tools and technological know-how utilizing new telecommunications technology. Specifically, this concerns development of a digital platform for the Katinnganiq Makerspace Network (KMN) to support social connections and supportive peer networks

- **Integrate community support**, including wellness services, where youth can access social/community services delivered on a 'whole person' basis in Makerspaces. We expect each Makerspace to be a connection to local mental health resources through staff trained in ASIST (Applied Suicide Intervention Skills Training) and Trauma informed practice - as well as a direct connection to other resources offered by the Embrace Life Council and local counselling services.

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2) **Scope of this PIA:** Explain what part or phase of the initiative the PIA covers and what it does not cover.

This is a preliminary PIA that outlines where we see potential privacy implications and how we will address them throughout this initiative. Feedback from the Privacy Commissioner of Nunavut will be sought and considered. If selected as winners, we will continue to work with the office of the Privacy Commissioner of Nunavut to develop a fully fleshed out PIA.

3) **Elements of Information or Data**: List the personal information data elements involved in the initiative. This could include citizen's name, age, address,educational history, work status, health information, financial information, photos, comments on a blog, license numbers or hiring data.

- Name
- Age
- E-mail address (and other contact information like telephone numbers)
- Name of parent or guardian
- Phone number of parent or guardian
- Food allergy information (Allergies? Anaphylactic? Symptoms, Warning signs)
- Network username
- Individuals own art/work
- User-generated data on a closed online forum (text-based messages, photos, code, art projects)
- Opinions and thoughts given through consultation and evaluation efforts (includes surveys, one-on-one interviews, sharing circles, journaling, voice recordings, videos, participants observation, descriptive reports), as well as personal demographic information such as age, race, gender and ethnicity) that relate to the KPI's outlined in chapter 3: performance measurement.

4) **Description of Information Flow (include text and diagram)**: Attach an information flow diagram showing how information will be collected and disclosed as a result of the initiative.

The collection, use, and disclosure of personal information for this initiative will be contained to four main areas and will be sought, as much as possible, though written and informed consent. The four main areas are:

- Makerspace Registration:

To participate in a makerspace, an individual will be requested to register by providing personal information (their name and age) to sign a liability waver and allergy form. Individuals will be asked to read the code of conduct and waiver form for use of the space – and provide their name, age, and signature, (or if a minor, the name and signature of their parent or guardian). Since a makerspace may on occasion serve snacks and food, Individuals or their parents/guardians will also be asked to fill out an allergy form, disclosing any known food allergies and instructions to inform staff on emergency procedures and emergency contact information. This information will be stored in hard-copies at the location, and kept on file for 12 months after the individuals last attendance. The allergy form may be updated at any given time by an individual or their parent or

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guardian (if they are a minor).

- Katinnganiq Makerspace Network Digital Platform:

When in the makerspace, an individual will be able to access and use makerspace computers, software, e-learning content, hard-drive storage space (not cloud) and a user forum through a Single-Sign-On security platform – which will require an individual to create an account with a username and password associated to an email address. Individuals may also access the network through a temporary/single use username and password.

On the user forum, individuals may generate and share personal information (in the form of messages, photos, ideas, opinions, for example) with others on the same network. Individuals will have the right to delete this information at any point in time.

- ASIST Certified Staff and Trauma Informed Practice

At the makerspace, staff will be trained in ASIST (Applied Suicide Intervention Skills Training), and Trauma-informed practice, coordinated by the Embrace Life Council. ASIST is a best practice training developed by LivingWorks which provides people with skills to help prevent the immediate risk of suicide. Trauma Informed Practice is a half-day training designed to increase individual success and well-being in Nunavut. It helps participants understand how to better support individuals who have experienced trauma, whether first-hand, historically, or intergenerationally.

An ASIST certified staff person will act in accordance with their training and continuously disclose that they are ASIST Certified (The makerspace will have ASIST stickers displayed to indicate that one or more staff are ASIST certified). ASIST trained staff will have the capacity to provide guidance and first aid to a person at risk in ways that meet their individual safety and privacy needs. In other words, Staff be trained to spot risky behaviors and mental health experts will be asked to intervene. In no way will Makerspaces staff attempt to provide professional/clinical care.

A staff person will act on their duty to report a child needing protection only to report any indications of immediate risk of self-harm, or suspected cases of child abuse or neglect, as required by the Nunavut's Child and Family Services Act.

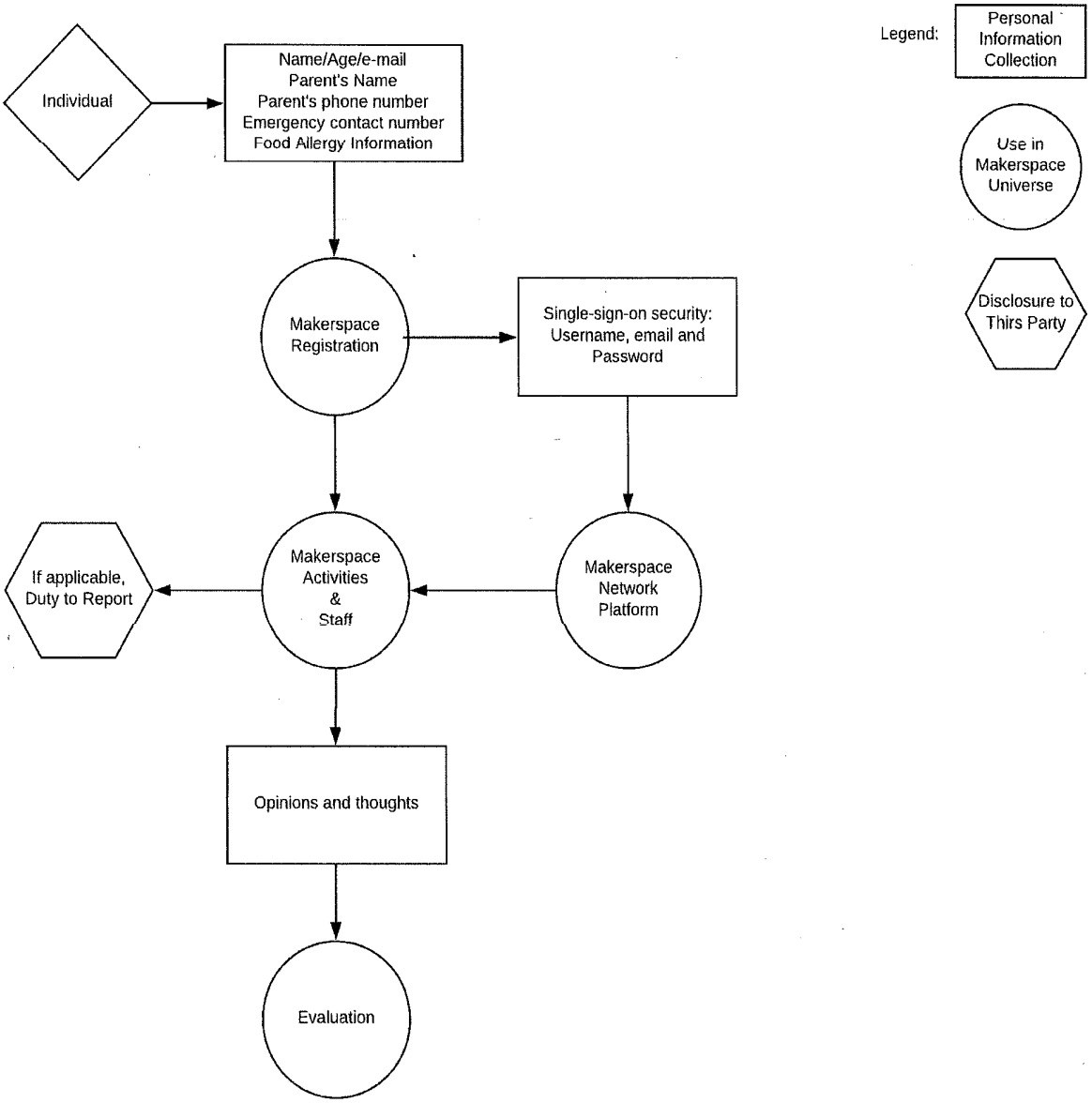
- Evaluation:

When conducting evaluation for Makerspaces, individuals will be asked for their written and informed consent to provide, use and disclose their opinions in relation to the KPI's outlined in Chapter 3: Performance Measurement regarding the makerspace and its programs. Anonymous demographic information such as age, race, gender and ethnicity will also be collected if voluntarily provided. Individuals will be asked for this information mostly through surveys, as well as through one on one conversations, sharing circles, interviews. They may choose not to provide any information. If they do, the information they provide will be collected anonymously and with care to be non-identifiable, and will be used for evaluation purposes only, such as informing decision-making and improving programs. Evaluation data will be published in public reports.

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C. Collection, Use and Disclosure of Personal Information

5) **Limiting Collection, Use and Disclosure:** Privacy is a fundamental right of citizens and so any limitation on the privacy of citizens should be carefully analyzed to ensure such limitation is warranted. If your project involves highly sensitive personal information, a broad collection of personal information or a serious impingement on privacy[4] answer the following four questions before proceeding: what questions ?

- Makerspace Registration:

The collection of the personal information identified for registration and participation in makerspace activities is necessary for makerspace staff and instructors to know who, and how old the participants are; to make sure that they have parental or guardian authorization to be there; to know that each individual (and/or their parent/guardian) has read and agreed to the code of conduct and signed the liability form; and because a makerspace might on occasion serve snacks and food, there is a need for staff to be able to take necessary precautions in the event of a food allergy, and have an appropriate emergency action plan and contact information should an allergy/medical emergency occur.

This information will be limited in use - accessed only by Makerspace staff, and not to be disclosed to any third party. We believe that having this information will support makerspace staff to adjust language and activities to suit participants varying age range, and to be able to communicate with them and with parents about programs being offered, schedules, and other related notices. In the case of food allergies, having the knowledge of what foods to avoid as well as what protocols to follow can be life-saving in case of emergencies. The information we collect will be the minimal to provide effective services – though at the moment no less privacy invasive methods have been tried.

- KMN Digital Platform:

Because each makerspace will have a series of shared computers available to the public, it will be necessary to protect user's personal information that is generated through their use. For that reason, we will request each user to set up an account to access the software, resources and user forum that will be available. The account set-up will request an email address, a username, and a password for a single-sign-on (SSO) authentication (like Kerberos) to the KMN Digital Platform – which enables each user to access the platform in a secure and private way – allowing for one's personal use of the resources while providing a storage space for individual work. The SSO use of an email address/username and password will reduce the amount of sign-in's to individual products, therefore reducing the amount of personal information collected as well as the security threat to that information. Therefore, the SSO provides the most amount of security combined with a minimum requirement of personal information. A user account will be deleted after 12 months of inactivity. Storage for each account and computer will be synchronized through a Network Attached Storage Solution (NAS) – which is a system that connects a storage device to a network, allowing storage retrieval of data from a centralized location for authorized network users. Files saved in the local Lab and network attached server will be encrypted while synchronized through cloud services through a RAID management system like Synology.

- ASIST Certified Staff and Trauma Informed Practice

One of the goals of this initiative is to provide a space where users can connect to culturally safe wellness resources. The Trauma-informed practice training, along with the ASIST Training delivered by the Embrace Life Council are important resources for front-line workers to better support Inuit youth. With this training Makerspace staff will have the skills, not to provide counselling, but to provide

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guidance and mental health first aid to a person at risk in ways that meet their individual safety needs. This measure presents itself as an effective way that feeds into the overall role of Makerspaces in promoting life and improving pathways to mental wellness by connecting to culturally safe wellness resources. There will be no collection and use of personal information recorded by the Makerspace – with conversations occurring only between individuals at a personal level. The only instance in which personal information will be disclosed, is through mutual agreement between Staff and individual as part of a safety plan – or when a staff person sees the need to act on their duty to report a child needing protection in relation to immediate risks of self-harm, or suspected cases of child abuse or neglect, as required by the Nunavut's Child and Family Services Act. In this case, the disclosure of personal information to the relevant authorities is proportional to the need.

- Evaluation:

In terms of evaluation, we will be collecting personal information in the form of thoughts and opinions, as well as personal demographic information of users which are necessary and effective to inform decision making and improve services. This information will be collected anonymously and with care to be non-identifiable. It will be used only by the staff authorized to collect and analyze the information. Evaluation results will be publicly published without any attachment to the individuals (anonymously).

6) **Legal Authority for the Collection, Use and Disclosure of Personal Information:** For each of the collection, use and disclosures identified, evaluate your public body's legal authority and complete the following table

Personal Information Authorities Summary			
7)	**Personal Information Description/Purpose**	**Type**	**Authority**
1.	Name, Age, Name of Parents, Signature, Use of space, liability waiver, allergy forms for Registration	Collection, Use	ATIPP Part 2, Division A: 40-42, Division B 43-46 PIPEDA schedule 1 6.1
2.	Email address, username, password for KMN Digital Platform Access	Collection, Use	ATIPP Part 2, Division A: 40-42, Division B 43-46 PIPEDA schedule 1 6.1
3.	Thoughts and opinions submitted as part of evaluation and/or consultation	Collection	ATIPP Part 2, Division A: 40-42 PIPEDA schedule 1 6.1
4.	Thoughts and opinion processed by Makerspace Org to inform decision making and improved services	Use	ATIPP Part 2, Division B 43-46 PIPEDA schedule 1
5.	Published evaluation results	Disclosure	ATIPP Part 2, Division C 47-49 PIPEDA schedule 1

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Compliance with Personal Information International Disclosure Protection Act ("PIIDPA"):
PIIDPA requires that personal information in the custody or control of a public body shall not be stored or accessed outside of Canada, subject to limited exceptions (s.5(1)). Set out here whether or not there will be any proposed storage or access outside of Canada and if so, describe what *PIIDPA* exceptions apply. See **Appendix D** for a summary of the *PIIDPA* exceptions.

Answer: The personal information collected, used, and disclosed as part of this initiative will be stored only within Canada.

D. Correction, Accuracy and Retention of Personal Information

1) How is an individual's information updated or corrected?

An individual may update their personal information for registration personally with Staff at the makerspace or communicated it by email to staff. As per internationally accepted privacy principles and good information management practices, the name and contact information of a staff person will be provided to all individuals at the time of collection, and will be available publicly. Information used for the SSO to access the network can be updated through one's profile at Makerspace computer. For evaluation information that has already been disclosed in published reports or to third parties (previously identified for and consented to) in the 12 months before a request for correction of that information is received – then the KMN will notify the third party of correction, and/or issue a correction/rectification.

2) If information is not updated or corrected (for physical, procedural or other reasons) please explain how it will be annotated?

If one wishes to submit additional evaluation information to update the thoughts and opinions provided, they can contact Makerspace staff to submit additional information.

3) If personal information will be disclosed to others, how will the public body notify them of the update, correction or annotation? (See s. 25 of *FOIPOP* for further information on correction and accuracy obligations).

No information will be disclosed to third parties other than evaluation information which will be published and collected anonymously. Additional evaluation information that is provided will be included as best as possible before publishing, and if after publishing, it will be included in the next annual report.

4) Does your initiative use personal information to make decisions that directly affect an individual? If yes, please explain.

Yes. Our initiative will collect personal information for evaluation in order to make decisions to better improve services for the individuals who use those services and provided their feedback. This will include what kinds of programming are available and how that programming is delivered.

5) Do you have a records retention and/or disposition schedule that will ensure that personal information is kept for at least one year after it is used in making a decision directly affecting an individual?

The personal information collected for evaluation informing decision making will be kept on file in the Makerspace office for at least a year it so that the individual has a reasonable opportunity of obtaining access to it. After that time, and when the use of that personal information is expired or no

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longer viable, we will proves to delete it securely either by shredding or electronic erasure.

E. Security of Personal Information

1) **Reasonable security: Administrative safeguards** – Describe administrative safeguards (such as policies, training, contract provisions, consent forms etc.).

Administratively, we will develop policies that protect individual's privacy and that comply both with ATIPP, PIPEDA and internationally recognized privacy and information management practices. Staff will be trained with regard to privacy issues and contracts will be in place to limit the collection, use and disclosure of personal information without written and informed consent. The request for consent will be clearly described and articulated in each administrative form that requires the input of personal information – as will be the parameters for the use and disclosure of such information.

2) **Technical Safeguards** – Describe technical safeguards (such as passwords and user ID, authentication, encryption, firewalls and intrusion detection, secure transmission, disaster recovery).

The technical safeguards include the Single-Sign-On authentication for makerspace computers to prevent unauthorized access to individual accounts. We will be using the Kerberos authentication technology, most commonly used by Microsoft Windows and which uses symmetric key cryptography and requires trusted third-party authorization to verify user identities. Additionally, each computer available in a Makerspace will contain anti-virus and firewall software.

3) **Physical Safeguards** – Describe physical safeguards (such as secure access, laptops secured to desk, alarm systems).

The hard copy files and computers containing personal information will be securely stored in a separate room/closet in the Makerspace, which will be restricted to Makerspace staff and will be kept locked during out of office hours. The Makerspace building/room will be locked when not open to the public, and where possible secured with a building alarm system.

4) **Auditing** – Describe auditing capability and strategies (audit logs, records of user activity, proactive and focused audit capacity).

At this point, we anticipate that the Makerspace Manager and IT manager will have the capacity to conduct audits and will be able to view the records of activity for different users in the digital network. Whether or not they will have access to saved user work is yet to be determined.

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5) **Access Matrix** Access to personal information must be limited to those employees whose job responsibilities require that they access the personal information. Attach a copy of the user access matrix. A user access matrix will list all of the position types (eg. clerical, manager of investigations, finance director) across one axis and all of the personal information types (or file types or data modules) across the other. The matrix will identify by position which individuals will have access to the identified data.

	Registrant Information	User Data in Digital Network	Evaluation Data	ASIST related information
KMN Executive Director			✓	
Local Makerspace Manager	✓	✓	✓	✓
Makerspace Staff/Instructors	✓	✓	✓	✓
IT Manager	✓	✓		

F. Risk Mitigation

1) Assess the impact on privacy, confidentiality and security of personal information as a result of the new program or service or change and make recommendations for mitigation of privacy risks. See **Appendix F** for examples of risks and mitigation strategies.

Risk Mitigation Table

	Risk	Mitigation Strategy	Likelihood	Impact
1	Authorized user views record for personal reasons	Log all read only and change activity Oath of employment and confidentiality agreements Training	Likelihood increases with more users and more staff	More sensitive data results in higher impact More data exposed by incident results in higher impact

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2	IT Manager fails to report privacy breach to Makerspace body	Define Contractual terms: Require reporting within 24 hours to Makerspace Manager Impose penalties for failure to report and late reporting	Severity of consequences for IT Manager may lower the likelihood	Same considerations as above
3	Users breach privacy of other users	Provide code of conduct training that includes specific policies on privacy and consent Implement adequate administrative, technical, and physical safeguards	Likelihood increases with more users Severity of consequences for users privacy breach may lower the likelihood	Same considerations as above

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H. Approvals

Completed by:

[redacted] **Pinnguaq Association** **Feb 25th, 2019**

[Insert position] Date

Reviewed by:

Privacy Officer Date

[Insert position] Date

Approved by:

8) [Insert Executive Sponsor] Date

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★ "To be the city that breaks the cycle of Indigenous youth incarceration by creating a new cycle focused on building purpose, belonging, security + identity."

Saskatoon – $10 M:11

repository of data

collects metadata, contact information

ATIA - 21(1)(b)

☑ PPIA / PRA

☑ letter from OIC

[redacted]

SASKATOON

Office of the
Saskatchewan Information
and Privacy Commissioner

March 20th, 2019

Wenda Atkinson
Access and Privacy Officer
City of Saskatoon
222 3rd Avenue North, Saskatoon, SK S7K 0J5

Dear Ms. Atkinson:

Re: Preliminary Privacy Impact Assessment - ConnectYXE Program

This letter is in response to the Preliminary Privacy Impact Assessment (PPIA) for the Connect YXE Program, which was received by our office on February 15, 2019. An amended version of the PPIA was later received on February 27, 2019, following a telephone conversation between our office and the City of Saskatoon (City). The PPIA forms part of the City's final proposal for their participation in the Government of Canada's Smart Cities Challenge.

BACKGROUND

In November 2017, the Government of Canada launched the Smart Cities Challenge (Challenge) which challenged communities across Canada to develop projects to improve the lives of citizens using data and connected technology. The Government of Canada received and assessed over 200 applications and of those, twenty finalists were chosen including the City of Saskatoon. The Challenge offers finalists an opportunity to win prize money in the amount $5 million, $ 10 million or $ 50 million dollars to develop and implement their proposed projects. The City is competing in the $ 10 million dollar prize category.

In April 2018, Canada's federal, provincial and territorial privacy protection authorities, including our office, wrote to the Minister of Infrastructure and Communities to urge the Government of Canada to take proactive steps to ensure that privacy and security of personal information are considered in the selection, design and implementation of the winning proposals.

In this regard, in August 2018, Infrastructure Canada issued a finalist guide requiring all finalists to engage with the privacy protection authority in their jurisdiction and to submit a final proposal that contains, among other elements, a chapter on data and privacy. The guide also requires that the final proposal include a PPIA that would also be provided to the privacy protection authority in their jurisdiction, if the proposed project will involve personal information. If the project will not involve personal information, a

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Preliminary Rationale Analysis would be required instead. The purpose of the Preliminary Rationale Analysis is to document how the finalist determined that personal information would not be involved in their project.

Our office wrote to the City on June 12, 2018 to congratulate the City on becoming a finalist and encouraged the City to consult with our office to provide details regarding the City's proposed project. Telephone calls between our offices took place on February 11, 2019 and February 25, 2019 to discuss the City's project in general terms and to clarify our office's expectation regarding the PPIA to be submitted. On February 15, 2019 and February 27, 2019, our office received copies of the City's:

- Finalist proposal
- ConnectYXE PPIA
- Digital Information Technology Security Policy
- Privacy and Confidentiality Policy
- Data Management Plan
- Privacy Breach Protocol

As stated in the finalist proposal, ConnectYXE will combine technology to connect indigenous youth, and their families and supporters, with existing service provider organizations in Saskatoon, to reduce indigenous youth incarceration. At a basic level, ConnectYXE has two components: the front-end which offers various methods for users to interact with ConnectYXE, and the back-end which involves creating a large repository of data to provide content to ConnectYXE and which serves to identify trends, generate reports and evaluate services. ConnectYXE involves many third party service organizations in Saskatoon and a third party service provider who will provide and manage the technology for the back-end component of the program.

We would like to commend the City of Saskatoon for taking on such an important social issue and for the time and effort the City has devoted thus far to developing its innovative solution. Our comments below are focused primarily on the contents of the finalist proposal and the ConnectYXE PPIA. Given that the ConnectYXE program is in the early stages of development, with most of its components at the conceptual stage, our comments are high level and serve to identify potential areas that may need to be further examined via a Privacy Impact Assessment.

COMMENTS ON FINAL PROPOSAL AND PPIA

Does the ConnectYXE program involve personal information, or personal health information?

Based on the contents of the finalist proposal and the PPIA, it is unclear whether the City has appropriately assessed whether personal information or personal health information, is ,or will be, involved. The finalist proposal describes various components of the overall program that could collect personal information. For instance, on page 18 to 21, the proposal states that the front-end component of ConnectYXE will allow a user to interact with ConnectYXE using various methods such as: a smartphone app, a mobile device, a public or personal computer, a public touch screen (kiosk), telephone, chat and Facebook. The proposal does not elaborate on whether any personal information may be collected from users via these various

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methods, especially via social media, nor discuss how ConnectYXE will prevent certain personal information from being collected in the first place, if that is the goal.

Devices connected to the internet, with or without Wi-Fi, have the ability to connect and communicate a wide range of online and offline information that may include location, browsing history, IP addresses, device unique identifiers, media access control (MAC) address, among other information. Furthermore, mobile apps, if not developed in a privacy conscious way, may collect or have access to personal information stored on a user's mobile phone. Federal, provincial and territorial privacy protection authorities in Canada, and elsewhere, have already issued various investigation reports and guidance documents related to these issues, which we would encourage the City to consult should they win in their category and continue developing the ConnectYXE program.

In regards to the ability of users to interact with ConnectYXE by calling in to the system, or using a chat feature, it is unclear if there will be transcripts produced from these calls and chats and if these transcripts will be retained, even for a short period of time. Users who call and use the chat feature may inadvertently provide personal information, even if it is not requested. In these circumstances, the City cannot fully control what information a user provides.

Furthermore, the illustration use case provided on page 5 of the proposal states that if a youth connects to ConnectYXE and accepts an offer to receive a free transit pass to get to a shelter, ConnectYXE would need to communicate with the youth's phone to provide that free pass. The use case does not provide details of the personal information needed to provide the free pass as a token to a user's phone. Presumably, this would require the youth to provide identifying information such as their mobile phone number so they can receive the pass via text, or an email address to complete the transaction. Our office sees value in offering various communication methods to users of ConnectYXE but these methods should be developed and implemented with appropriate measures to protect personal information.

Additionally, page 6 of the final proposal indicates that measuring outcomes related to the use of ConnectYXE will involve outputs such as the number of users and repeat users. Collecting data about the number of users could involve collecting aggregate data; however, it is unclear how the City would know who is a repeat user without the ability to identify specific users and to know when they have interacted with ConnectYXE more than once. Such information could be personal information.

An earlier version of the final proposal provided to our office indicated that a future iteration of the ConnectYXE would allow users to authenticate to ConnectYXE and maintain a personal profile within the system. It is unclear why this information was removed from the subsequent version of the proposal provided to our office – whether because these features will no longer be offered at all, or if such features were considered to be too far into the future to be included in the proposal for the Smart Cities Challenge. If there are future plans for ConnectYXE to allow users to create profiles and be authenticated, our office would not be opposed to these features. However, our office would expect these features to comply with privacy legislation in the province and to have built-in privacy protections. Additionally, our office would expect the City to undertake appropriate security and privacy assessments to identify and mitigate any potential risks.

Based on the contents of the proposal, as it relates to users interacting with ConnectYXE, it is unclear how the City arrived at the conclusion in the PPIA that the ConnectYXE program will not require users to

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authenticate nor to provide personal information. As stated previously, although many components of the ConnectYXE are at the conceptual stage, our office expected that the City would map out the information flows for the various communication methods that will be offered to users, and to list all the information that may be collected, shared, used and retained for each method. This would provide an opportunity to identify potential collections of personal information, or personal health information, and to identify areas to be assessed later via a PIA. Our office communicated this expectation to the City on February 7, 2019 via email correspondence and also highlighted the importance of considering context in making the determination about whether or not personal information could be collected.

In regards to the back-end component of the ConnectYXE, the final proposal states that all partners, including community based organization, will transfer data to a large data repository managed by a third party service provider, ISM Canada. The concept for this large repository is based on the design of the Saskatchewan Social Innovation Hub (SSIH), also managed by ISM Canada. The proposal states that ConnectYXE will leverage the security and privacy elements of that design but does not provide details of those security or privacy elements. It is unclear whether the City has assessed, or intends to assess, those existing privacy and security elements to determine if they are appropriate for the ConnectYXE program, in line with current privacy legislation and whether any compensating privacy and security controls will be needed. There is also no indication in the PPIA whether any work has already been undertaken in this regard.

Additionally, the proposal states that all partners who will provide their data to the ConnectYXE program will complete a detailed assessment of their technological maturity and their data. This will allow them to identify whether their data contains any personal information or personal health information so that a PIA can be completed. At this stage, the processes by which any personal information or personal health information will be removed from the data will be identified. Elsewhere in the proposal, on page 59, it states that IT operations will monitor for data and privacy breaches by routinely examining data submitted from partners to identify personal data that may have been inadvertently transmitted to ConnectYXE. Based on this information, even after partners have completed PIAs and their data has been de-identified, there is still a risk that the ConnectYXE program will contain personal information. Again, it is unclear how the City concluded in the PPIA that the ConnectYXE program would not involve any personal information, or personal health information, based on the contents of the proposal.

The last statement in the PPIA states that ConnectYXE will conduct an extensive PIA should the City be a successful winner. It is unclear what the scope of such a PIA would be and why the City has stated it would be required at this stage – given the conclusions in the PPIA. Our office agrees that a more comprehensive PIA, that more accurately describes the personal information to be involved in the ConnectYXE program would be needed should the City be a successful winner. This PIA would need to elaborate on the points of data collection, processing and access and ensure that security assessments and risks are incorporated into the overall assessment of potential privacy risks and compliance with privacy legislation. Furthermore, the comprehensive PIA to be completed by the City should also incorporate the PIAs to be completed by its partners and include an assessment of ISM Canada's role in the program, which at present, is lacking in detail in the proposal and the PPIA

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Legislative Authority

The proposal and the PPIA do not currently state the legislative authority for the ConnectYXE program as proposed, though the City did provide this information to our office via email correspondence on March 1, 2019. The City indicated that *The Cities Act* provides the authority for the project. Should the City be selected a winner, our office expects that documents related to the ConnectYXE program will identify all applicable privacy legislation and identify the regulatory and legal framework for the project. For example, we would expect a PIA related to the ConnectYXE program to clearly identify the sections of *The Cities Act* and any other applicable law(s) or policy(ies), authorizing the City to collect information from indigenous youth and their families. In addition, the PIA should clearly list all the data elements that would be collected, explain the purpose for the collection of each data element and refer to the specific section of the legislation or regulation that permits the collection of each data element.

if personal data is collected

Providing this level of detail would allow the City to comply with applicable legal and policy requirements and ensure only the minimum amount of personal information is collected. It would also allow the City to demonstrate how it meets the legal requirements of PART IV Protection of Privacy of *The Local Authority Freedom of Information and Protection of Privacy Act* (LA FOIP), which requires that personal information is only collected, used and disclosed for a purpose that relates to an existing or proposed program or activity.

Integrating security and privacy assessments to appropriately identify and mitigate risks

As stated in the joint letter to the Minister of Infrastructure and Communities, effective safeguards are especially complex to implement in the smart cities context given the divers forms of technology deployed. For this reason, it is critical that a there be appropriate security assessments undertaken, that complement privacy assessments. The ConnectYXE depends on various technologies and yet the information provided in the proposal and the PPIA related to these technologies was quite limited. There were no copies of existing technical documents, or details of when and how security assessments will be undertaken later. As mentioned in the preceding section of this letter, the ConnectYXE program will be based on the design of the SSIH, which according to the proposal has been audited and approved by the IT Division of the Government of Saskatchewan. The findings and recommendations from those audits were not included in the proposal or the PPIA.

According to the proposal, the ConnectYXE program will also leverage other existing services like the Homeless Individual and Families Information System (HIFIS). HIFIS data are available to the ConnectYXE by an application layer interface that has already been developed though the proposal and the PPIA do not elaborate on the security assessments that may have also already been undertaken in this regard.

PPIA assessment missing our partners

Furthermore, the use of Microsoft's cloud solutions to host the environment required for ConnectYXE is involved though again, there are no technical details regarding the use of cloud storage. All connections to systems must be considered in the overall assessment of security and privacy risks and detailed in future security and privacy assessments. Should the City be a winner in the Smart Cities Challenge, we recommend that a future PIA to be developed contain more emphasis on the complex safeguards that will be incorporated into the ConnectYXE program and that the PIA contain evidence in the form of copies of security assessments and other documents to demonstrate the selection and implementation of safeguards.

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Given the complexity of the ConnectYXE program and the various technological components involved, it may be more efficient to have a more modular approach for assessing privacy risks by completing one overarching PIA with multiple, more narrowly scoped PIAs to assess individual components. The proposal identifies ISM Canada as the "data custodian" in the ConnectYXE program, which implies ISM Canada will be responsible for the security of data. As such, the City should consider how it will work with ISM Canada to ensure ISM Canada is also conducting appropriate PIAs that will form part of the overarching PIA that the City will complete. The City in this case is ultimately accountable for all aspects of the ConnectYXE program. ISM Canada is the Information Management Service Provider and so should be identified as such in the program documentation. We would encourage the City to contact our office for guidance on how to develop a modular PIA approach for the ConnectYXE program, should the City be selected as one of the winners.

Other considerations

The proposal lists a number of main stakeholder groups that will continue to be engaged as part of the ConnectYXE program but does not currently list any stakeholder groups that could provide guidance or expertise related to privacy – whether that is in-house privacy resources or our office. Should the City be selected as a winner, we would expect the City to continue to engage with our office and keep our office informed of developments related to the ConnectYXE program. A plan for how the City will engage with our office should be developed and included in any PIA(s) to be conducted in the future.

Page 17 of the proposal provides details of communications plan to be used to create awareness about the ConnectYXE program and used to educate and train partners involved. These plans do not appear to include a privacy component which would be important to ensure full transparency of the information practices that will effect users of the ConnectYXE program. The implementation of free WiFi in targeted areas and communities is a component of the program that may raise concerns from individuals living in those communities about the type of information collected and potentially used about their community and the individuals using the free WiFi. Our office recommends that the City ensure communications plans and any outreach with communities include a discussion on privacy.

It is unclear whether the ConnectYXE program would receive information from partners about individuals who follow through with services requested via the program. For instance, taking the use case on page 5 of the proposal, if a user requests shelter and a meal, it is unclear if the organization(s) providing the shelter and meal will report back to the City about whether or not the user actually followed through with the requests. It would seem useful for the City to know whether the ConnectYXE program is having an impact, though it may involve identifying users and reporting back on those users. This is an area that would need to be further elaborated on in any future PIA(s).

CONCLUSION

As indicated in the preceding paragraphs, the proposal contains information to indicate that there is likely personal information, or personal health information, involved in the ConnectYXE program, although the PPIA concludes that no personal information is involved. Having such conflicting views and conclusions in documents related to the same program makes it difficult for our office to make specific comments about the proposed privacy protections or privacy practices.

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Also, since there were few technical details provided at this stage regarding a program that is almost entirely dependent on technologies, it is also difficult for our office to offer more specific comments regarding the potential security and privacy risks related to those technologies.

Should the City be selected as a winner, our office recommends that the City resolve the contradicting information in the ConnectYXE program proposal and PPIA so that a more accurate description and thorough analysis of potential security and privacy risks is included in these documents. We also recommend that the City consider the areas outlined in this letter that may need to be further examined via a more comprehensive PIA. Finally, we would like to request that the City continue to engage with our office on developments related to the ConenctYXE program. Our office is always available to offer guidance on PIAs, assessing security and privacy risks and on the requirements of LA FOIP.

We would like to congratulate the City again for being selected a finalist in the Smart Cities Challenge and for the work it has completed to date on the ConnectYXE program.

Yours truly,

Marjorie Platero
Analyst

cc: Jenny Tremblay, Director General, Smart Cities Challenge Directorate, Infrastructure Canada

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11 Appendices

11.1 Appendix One: Preliminary Privacy Impact Assessment

1. General

Name of Department/Division	Strategy and Transformation/Information Technology
Project Lead(s)	Jazz Pabla
Title	ConnectYXE

2. Description of the project including the purpose and objectives:

In response to the Federal Government's (Infrastructure Canada's) Smart Cities Challenge, the City has proposed a program that, should the City be selected as a winner, will execute over the course of the next 5 years. We have branded this program "ConnectYXE".

The mission statement of this program is "To be the city that breaks the cycle of Indigenous youth incarceration by creating a new cycle focused on building purpose, belonging, security and identity."

The technical solution proposed is to establish an independent board (incorporated or not) to provide governance over the engagement with community-based organizations (CBOs) and institutional partners, and to connect the services provided by those partners so that they are available to Indigenous youth, their families and to their "allies" – those who support and help them.

Users of the system – Indigenous youth, their families and allies – will not be required to authenticate, nor to provide personal information about themselves.

what are they considering as personal info?

A dimension of the program is to improve access to the internet in areas of highest concentration of Indigenous youth and families by providing free Wi-Fi in strategically selected neighbourhoods and kiosks in locations where youth "hang out". Access to the free Wi-Fi will not collect IP Addresses. Rather, raw data regarding how many individuals use the free Wi-Fi will be collected.

how can they identify if the same individual used it 2+ times?

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3. What type of information is involved in the project?

All information that will be contained by the ConnectYXE system will be data provided by CBOs and institutional partners. CBOs will remove any PI/PHI prior to disclosing any information to ConnectYXE. This data is encrypted as transmitted and at rest, and will be securely segregated within the ConnectYXE system, accessible only by the CBO who disclosed the data, and by the information management service provider, ISM Canada.

Departments of City of Saskatoon, Saskatoon Transit, and Saskatoon Recreation and Community Development will provide data that is available to the public and does not contain any PI.

As a part of the ConnectYXE program, we will provide free public Wi-Fi to a neighbourhood of Saskatoon. ConnectYXE will ensure appropriate network protocols are in place so that only internet data ("HTTP" or "HTTPS") is transmitted, which will limit access to devices onto the LAN side. DHCP will be set to provide IP addresses with a lease of 8 hours, so that IP addresses will not be associated with a specific LAN. Host names will not be exposed. Free public Wi-Fi may be contracted to an Internet Service Provider such as Shaw or Sasktel; this provider would provide additional network data protection services.

End users will connect to ConnectYXE by phone or by an internet connection. Users will not be required to identify themselves. Depending on the nature of the interaction, the user may be asked to provide their age (not their date of birth), and their gender. If the interaction is such that the individual's location is required, this may be requested. If the interaction results in a requirement to send a transit ticket, the user's phone number may be requested so as to send an electronic ticket. This data will used for the purposes of the transaction. Phone number and information that identifies the device (such as IP address) will not retained; other data will be stored as aggregated data only. This data cannot be used to identify a specific individual, and so is not considered PI.

4. How will the information be used?

The Information Management Service Provider, ISM Data Lab, uses Artificial Intelligence tools that mine the CBO data and extracts services provided by CBOs. Following processing, all source data extracted and analyzed by the Data Lab will be destroyed: only the aggregated results – the list of services available and other data surrounding and supporting these services – will be preserved.

5. Questions:

1 - Does the project involve any type of confidential information? (i.e. personal, sensitive third party or other confidential information)

No. No. CBOs will remove any PI/PHI prior to disclosing any information to ConnectYXE. As CBOs are onboarded,

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the ConnectYXE Council will conduct a pre - privacy impact assessment and a data sharing agreement with each CBO. This assessment will determine if the CBO data contains any PI/PHI. If it does, we will work with the CBO to develop a process whereby that data is removed before transmission.

We will subsequently monitor the data that is submitted to look for any PI/PHI; if found, it will be removed, and treated according to the protocols for a data and privacy breach.

2 - Is this a new program or service?

Yes. ConnectYXE is a proposal for the national Smart Cities Challenge. If it is a successful winner it will be a new service that connects youth, families and allies to additional CBOs.

3 - Are you making significant changes to an existing program or service?

No. This is a new service, that is modelled after the provincial Social Innovation Hub.

4 - If this project relates to an existing project was a full PIA completed? If so what is the project's name?

This does not relate to any existing project of the City of Saskatoon.

5 - Will you be data linking with other information within the City?

Yes. Yes, there will be aggregation of data provided from multiple CBOs and institutional partners. No linked data will contain PI/PHI because ConnectYXE does not have any.

6 - Will the project contract out any function?

Yes. ISM is our technology partner in this program. Upon being awarded the Smart City Challenge, the City of Saskatoon will form a governing body (the ConnectYXE Council) which will enter into an agreement with ISM Canada and will formalize the Information Management Service Provider service agreement.

7 - Will there be a collection of any personal, third party, or other confidential information via web-based technology?

No. If they have any, CBOs will remove PI/PHI prior to disclosing any information to ConnectYXE.

8 - Are you using personal information to determine eligibility for a program or service or for enforcement?

No. ConnectYXE provides a list of services available for end users. No personal information will be used to determine eligibility for a program or service, nor for enforcement.

9 - Will the personal information be shared outside the organization?

No. No PI/PHI from the City of Saskatoon will be disclosed.

10 - Will the personal information be stored outside the organization?

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No. Data from respective CBO will be stored in ConnectYXE, which "resides" in the Microsoft Azure Cloud. This data is partitioned and not accessible to anyone except the CBO providing the data, and by the ISM Data Lab. ISM is an Information Management Service Provider (IMSP) as defined by LAFOIP. CBOs will disclose only data that does not include PI/PHI into the system.

City of Saskatoon will not disclose any PI to ConnectYXE.

11 - Will the personal information be used for other purposes, including research and statistical purposes?

No. No identifiable PI/PHI will be collected, disclosed or used for any other purpose.

12 - Will the public be likely to have any privacy concerns regarding the project or the service that is being offered by the City?

Yes. During the engagement consultations with Indigenous groups there were expressions of privacy concerns. We will provide communications and notice of the IMSP agreement as evidence the data is not PI or PHI and is encrypted in transit, at rest, that the data are segregated and not accessible by others.

13 - Are you introducing changes to the business systems or infrastructure architecture that:

- **Affects the physical or logical separation of personal information.**

No. CBOs will remove any PI/PHI prior to disclosing any information to ConnectYXE.

- **Changes the security mechanism used to manage and control access to personal information?**

No. The system will introduce a net new system that will store data segregated by CBO, including a security mechanism used to access these data (by the CBO and by the ISM Data lab). CBOs will remove any PI/PHI prior to disclosing any information to ConnectYXE.

14 - Are there any other or additional reason for undertaking a PIA? If yes please explain.

Inasmuch we are importing data from CBOs, the process of onboarding those parties would each entail a PPIA. ConnectYXE will provide solutions regarding how the CBOs will ensure PI/PHI is not disclosed to ConnectYXE.

6. Legislative Authority of ConnectYXE Proposal

Principle:

The City of Saskatoon is a local authority as defined by section 2(f) of The Local Authority Freedom of Information and Protection of Privacy Act (LAFOIP). ConnectYXE will be a program of the City and will, therefore, be subject to the provisions of LAFOIP.

ConnectYXE will not be collecting PI or PHI; therefore, the data that will be disclosed by CBOs or institutional partners

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will be restricted to data fields that do not include PI/PHI or from which one can infer identifiable PI/PHI. It will be the CBOs that ensure the data fields disclosed to ConnectYXE do not include PI/PHI. ConnectYXE will monitor collected data, looking for incidental PI/PHI. If such incidental disclosure occurs, the City will undertake a privacy breach investigation following the City's Privacy Breach Protocol Guidelines.

ConnectYXE will conduct an extensive privacy impact assessment should they be the successful winner of the Smart Cities Challenge.

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Signatures

Project Lead Name & Title	Michelle Beveridge Chief of Staff, Mayor's Office
Signature	[redacted]
Date	Feb 14, 2019
IT Project Lead Name & Title	Jazz Pabla Manager of Technology Integration
Signature	[redacted]
Date	Feb 14, 2019
Director of IT Name	Paul Ottmann Director of IT
Signature	[redacted]
Date	Feb 14, 2019
Access and Privacy Officer	Wenda Atkinson Access and Privacy Officer
Signature	[redacted]
Date	Feb 14, 2019
Comments	Full PIA is required should the City be the successful winner of the Smart Cities Challenge
General Manager Name	Lynne Lacroix Acting General Manager, Community Services
Signature	[redacted]
Date	Feb 14, 2019

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Response from the Office of the Saskatchewan Information and Privacy Commissioner

The following response was provided to the City of Saskatoon Data and Privacy Office on Monday, March 4th, indicating the engagement of the team with the OIPC.

..., this email is to confirm that our offices have engaged in telephone calls on February 11 and 25, 2019, and that we receive various documents, including a copy of the City's finalist proposal and PPIA, on February 15 and 27, 2019.

We are currently drafting our response letter to the City which will include comments on the City's final proposal and PPIA. We hope to have this draft sent to you sometime this week. A final version of our letter will be prepared after you have read our draft. The final letter will be provided to you, with a c.c. to Infrastructure Canada before the April 9, 2019 deadline.

If you have any questions or need any information, please do not hesitate to contact me. Thank you,

Marjorie Platero

306-798-2360

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Tri-Council

PPIA Documents

1. MB Ombudsman PHIA-PPIA
2. Dexcom Clarity Information Security Policy
3. Letter from the MB Ombudsman
4. Letter to the OPC
5. OPC PIPEDA-PPIA
6. OPC PPIA Assessment

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1. MB Ombudsman PHIA-PPIA

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Manitoba Ombudsman
Privacy Impact Assessment Tool

Part 1: Summary of Program or Activity

Who?

Name of project
The Tri-Council Region Smart Cities Challenge

These are the Entities that have Co-operated in The Tri-Council Region Smart Cities Challenge
Opaskwayak Cree Nation, The Town of The Pas, and The Rural Municipality of Kelsey

Name(s) of project representatives
Rose Neufeld, Derek Neufeld, Glen Ross, Jim Berscheid, and Chad Zolinski

Other entities that may be involved

- Northern Regional Health Authority
- Opaskwayak Vertical Smart Farm
- Tri-Council Not-for-Profit Management Corporation (will be activated if the Challenge is won by the Tri-Council and be responsible for the financial administration as well as overseeing the progress and evaluation of the project)

What?

Summary of the new program, service, software, or change: *Provide an explanation of the new program, service or change and include an explanation of the current state.*

Our project is directed at improving the health of community members through the provision of direct to door food distribution of locally grown food. Fruits and vegetables, produced at the local Vertical Smart Farm, can be ordered via a smart phone application and then delivered to the door via electric cars. Additionally, an evaluation of the impact of eating more fruits and vegetables as it pertains to the health of an individual, specifically biometrics related to diabetes, will be conducted. This will take the form of a volunteer study group with approximately 200 participants.

Currently the OCN Smart Farm has begun growing fruits and vegetables and local people have been enjoying the produce. However, with a diabetes rate of about 50% of the population, we wish to create a link between healthy eating and improved health amongst community members, using this information to create hope and opportunity for individuals to increase their understanding and control of their own health.

Purposes, goals and objectives: *Describe what you are trying to accomplish with the new program, service or change. For example: improving client services, improving efficiencies, improving privacy protection, streamlining processes.*

Our project aims to reduce the rate of diabetes in the community and to reduce the high glucose levels that current diabetics are living with daily. We believe that access to good food and knowledge of the impact of good food on health will change the health and lives of our community members and that

the study will inform and contribute to the knowledge base of our communities as well as those of all Canadians.

We also aim to reduce the amount of food imported to the community. Currently the imported food is expensive and of generally poorer quality which is related to the transport time required to get the food to our northern location. The cost and the quality are impacting health because of the ensuing reduced use by our community members.

Describe the type of application: *Identify and describe the types of applications, platforms and external entities involved in the information flow (collection, use and disclosure).*

Health care professionals working at the Health Canada accredited health clinics will have access to study participant health information via the electronic medical record (EMR) which will be utilized to enrol and follow the study participants. The EMR utilized in the region is Accuro, which is one of the EMRS approved for use by Manitoba eHealth.

All health care data is protected by the PHIA legislation that governs personal health information.

Two health clinics will be utilized for the purpose of working with and supporting individuals who wish to be participants in the study group. One health clinic, Beatrice Wilson Health Centre, is operated by Opaskwayak Health Authority. The other clinic, The Pas Primary Care Clinic, is located within The Pas Health Complex in The Town of The Pas and is operated by the provincial Northern Regional Health Region. Both clinics follow the PHIA legislation and all staff have received PHIA training and have signed agreements of confidentiality under this legislation. All patient data is stored on an electronic medical record, Accuro, and the data is shared between the two sites. **The Northern Regional Health Authority is the trustee of this data.** Opaskwayak Health Authority has signed a Privacy Impact Agreement with the Northern Regional Health Authority (NRHA) which includes a Privacy Impact Assessment compliance document that was jointly signed at the time that Accuro was first shared by the NRHA with Opaskwayak Health Authority. Each of the clinics has a privacy officer, responsible for maintaining confidentiality, auditing, and to whom individuals may go to regarding concerns or any real or perceived breaches of their confidentiality that they wish to discuss.

Why?

Explain why you are implementing the new program, service or change, and describe the benefits.

This new program is being implemented because currently, and historically, access to healthy food is very difficult for our community, located in northern Manitoba. The distance that food must travel to reach our community results in high costs, low quality and early spoilage rates. This makes it difficult for many of our community members to purchase fresh food to feed their families. This has resulted in many families including little or no fruits and vegetables in their daily diet. The program we are implementing will assist in making food available and the study we are proposing will create a base of knowledge and a core group of individuals that become aware of the link between physical biometrics such as blood glucose levels and consumed foods. Our goal is to reduce the rates of diabetes and provide our community members with options to attend to their health through accessibility to healthy foods.

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We are utilizing technology to help us address the problem of adequate food supply knowing that new and innovative measures are required as the current means of acquiring healthy food is not addressing the increasing poor health statistics in our community.

Where?

Where is the data flow taking place? Is it online, in person, paper-based, in Manitoba, in Canada or the United States?

This project is taking place in Manitoba, Canada. All servers will be in Canada and communication will take place through locally available wireless communication infrastructures. The wearable device from Dexcom has been approved by the federal government for use in Canada. The web-based Dexcom CLARITY® is a data management software application that allows the transfer of glucose data to remote servers for data management. They are a U.S. company, and they store all their data in Germany as this is the country which currently has the highest data security safeguards in the world.

When?

Outline any key dates such as project deadlines, key milestones, implementation timeframes, contract parameters, etc.

Our project will begin in the fall of 2019 or early 2020 depending on when funds become available as a result of our community successfully winning the Smart Cities Challenge; an innovative initiative of Infrastructure Canada. Should we not be successful, this may be initiated later as we will continue to work towards funding opportunities to support this project as it is vital to the health of our community members and access to healthy food is critical for our well being.

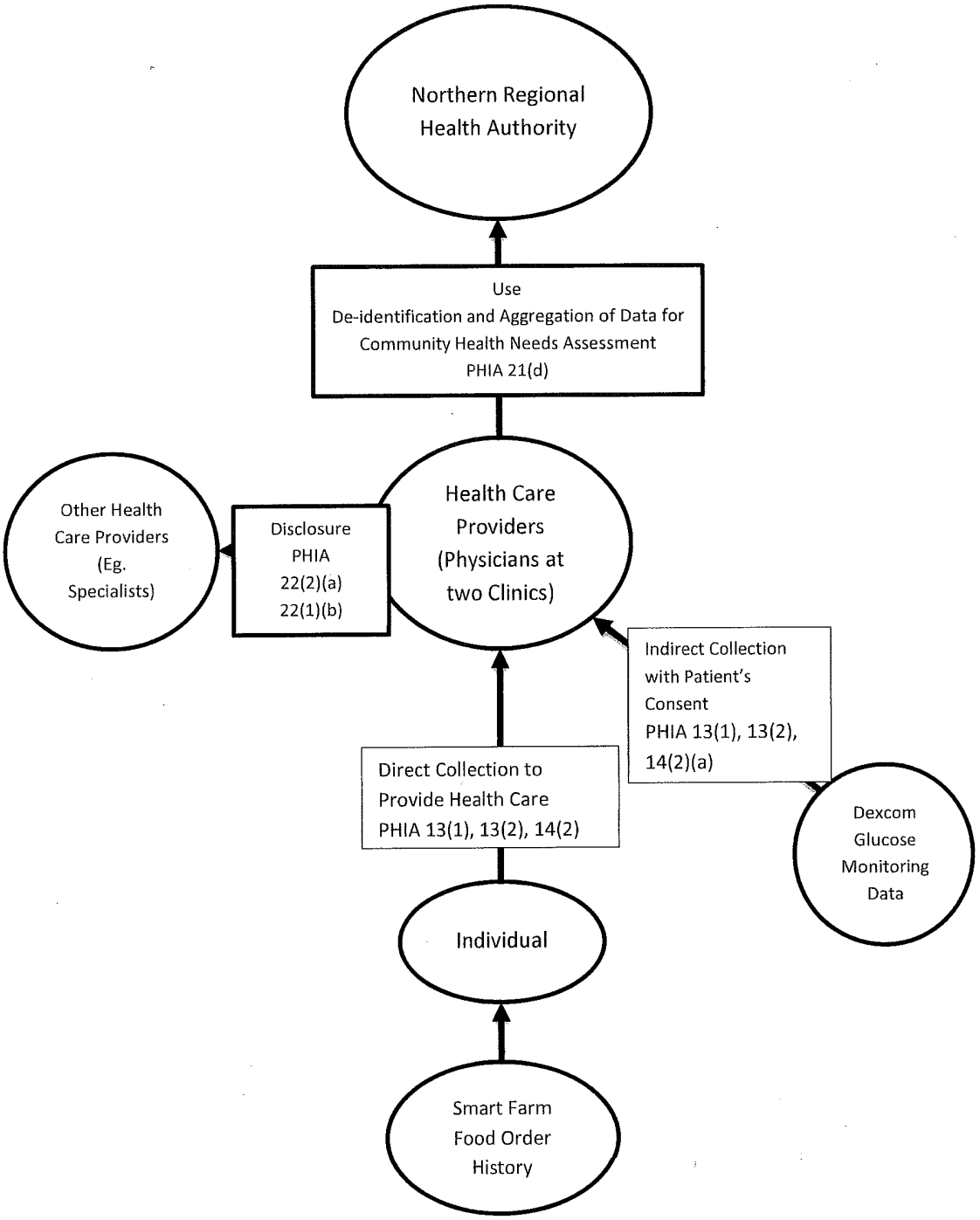
The first phase of the project will be development of required software and construction of the Plant Factory. This phase is anticipated to take roughly 9-12 months. The second phase of this project will seek community feedback as several different food products are grown and the customer base increases. Baseline health data from the study group will be collected prior to completion of the Plant Factory in order to gather biometric data prior to the introduction of Plant Factory products. This phase of the project will take approximately another 6-12 months. The third phase of the project is anticipated to see broad community consumption of Plant Factory products though the smartphone application along with a general decrease in community diabetes.

Part 2: Describe the Scope

1. **Describe the flow of personal (health) information** *Provide a description of how the information will flow within the organization, including any disclosures (information provided outside the organization). This section should include a brief description (written or visual) showing the flow of personal (health) information through the system from collection to use within the organization, and disclosures (sharing) outside the organization (if applicable).*

This information flow map outlines the collection, use and disclosure of personal or personal health information, with the corresponding legal authority for each information flow.

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2. **Who manages, accesses and uses the system?** *Describe who manages the system. Outline who are the intended users of the system within the organization and their connection(s) to the new program, service or change.*

The study participant group will become patients of the health clinic and all information related to their personal health information will be monitored under the privacy legislations applicable there.

3. **Are there any linkages to other systems?** *Explain any linkages to other programs or services. Example: Will data be collected from other systems and/or will data be shared with other systems? Provide timelines and explanation if future linkages are planned but won't be implemented immediately.*

Every 5 years, the province government and Opaskwayak Cree Nation undertake a community health needs assessment which includes aggregated and anonymized data that provides information to health leadership and planners regarding necessary programs and services required by the population. Given that the study group information will be included in the Accuro data, this data will be included in this higher-level assessment, although it will not be identified that these individuals were part of a study group. Rather, their information will be general to all patient data stored in Accuro.

The next data collection for the community health assessment to be completed by the NRHA is in 2019. Data for most individuals living in the Town of The Pas and the RM of Kelsey are collected under the NRHA assessment. The next data collection of this nature for Opaskwayak Cree Nation, under the direction of the Opaskwayak Health Authority is in 2022, as OCN recently completed theirs.

4. **Do you anticipate any potential future enhancements to the system?** *Will the system expand to include more users? Is a series of upgrades part of the contract for a new service or system?*

This is a five-year plan and we do not currently foresee any changes to the plan. We anticipate, as a positive result of the project, that a larger number of people will become interested in attending to their health and following their biometrics. They will be followed at the clinic as any member of the general population can do.

5. **Are there any potential future uses of information?** *Are there any planned secondary uses for the personal (health) information in the system such as research or analysis? A secondary use of the information is any use that is different from the reason the information was collected in the first place.*

The research generated from the study participant group will be utilized for publishing purposes as we hope that this may be of value to Canadians as we seek to address the diabetes epidemic that is facing many Canadian citizens and their families. In this case, all information will be anonymized or excluded if there is any chance that an individual could be identified. We are partnering with the University of Manitoba and one of their researchers who is currently completing a study on nutrition in prenatal women and is thus familiar with the region and the population. By hiring a PhD prepared researcher, affiliated with the University, we will ensure that all research is done under the ethics and standards set by this institution.

Part 3: Collection, use and disclosure of personal (health) information

1. Categories of personal (health) information to be collected, used and/or disclosed

i. Describe the personal (health) information that will be collected and briefly explain the intended use and the potential disclosures of the information.

Information to be collected by the primary care clinics includes name, address, contact information, age, sex, allergies, medications, marital status, medical history, current health status, and all other information as per current best practice in health care delivery. Additionally, the patient will provide

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data from their smart phone that has captured information from their wearable device and their ordering history and food consumption from the smart farm. The study participants will have certain biometrics measured. However, any person in the community can have this same care without being participants in the study group. The intended use of the study is to demonstrate the connection between food that is consumed and diabetes. It is our intention to respond to the growing diabetes epidemic in our community by demonstrating, using data, that we can impact our health in a positive way and then share our learnings with the nation.

ii. **Describe decisions and approval processes regarding collection, use and disclosure decisions**
Briefly describe the decision-making and approval process that governs the collection, use and disclosure of personal (health) information in the system. For example, how is management involved in the decision-making process?

Personal health information is collected and used for the individual's health as per PHIA and best practice standards of the nursing and medical professionals and their code of conduct within the primary care clinics.

2. Authority for the collection, use and disclosure of personal (health) information *Indicate the specific provision of the law, regulation or authorizing policy that allows you to collect, use and disclose personal (health) information. Such laws and regulations could include FIPPA, PHIA or the governing legislation for the organization.*

For participation in the study group, customers will become patients of one of two clinics and their information will be kept secure through PHIA and the information sharing agreement for the electronic medical record (EMR). The researcher will have everyone in the study group sign a consent form which includes risk, benefits, all data collected and storage of data.

Data collected from the continuous glucose monitoring device, manufactured by Dexcom, will be sharable with the healthcare provider through Dexcom's proprietary Clarity software. Dexcom provides secure, cloud based, storage of user data using AES-256 encryption and data transmission encryption using a minimum of TLS 1.1. Dexcom operates under the U.S. Health Insurance Portability and Accountability Act (HIPPA) of 1996. Further information about the data security management of Dexcom Clarity software is attached.

PHIA defines **"personal health information"** as recorded information about an identifiable individual that relates to

(a) the individual's health, or health care history, including genetic information about the individual,

(b) the provision of health care to the individual, or

(c) payment for health care provided to the individual, and includes

(d) the PHIN and any other identifying number, symbol or particular assigned to an individual, and

(e) any identifying information about the individual that is collected in the course of, and is incidental to, the provision of health care or payment for health care;

The project will involve personal health information (PHI), including:

- demographic information
- health information related to the provision of health care to the individual
- biometric data from diabetes glucose monitoring device
- order history of food from the smart farm

Trustee

Under PHIA **"trustee"** means a health professional, health care facility, public body, or health services agency that collects or maintains personal health information.

The Northern Health Region is identified as the trustee for the purposes of this project. The personal health information will be collected by physicians (health professional) at medical clinics (health care facility). The Pas Primary Care Clinic (health care facility) and the Northern Health Region (public body) are both trustees. The Pas Primary Care Clinic is operated by the Northern Health Region, and the Region would also be considered the "trustee" of the PHI collected at the Clinic as the Region would "maintain" the PHI. The physicians at Beatrice Wilson Health Centre, OCN (operated by the Opaskwayak Health Authority) are contracted by the Northern Health Region and may be considered employees of the Region:

Please indicate the authorization for:

Collection

Personal health information to be collected includes information about an individual's health status and diabetes management and information about their food order history and glucose monitoring information relating to management of diabetes. Collection of personal health information will be for the purpose of providing health care to the individuals. The following provisions of PHIA provide authority for the collection of personal health information in these circumstances:

> **Restrictions on collection**
> **13(1)** A trustee shall not collect personal health information about an individual unless
> (a) the information is collected for a lawful purpose connected with a function or activity of the trustee; and
> (b) the collection of the information is necessary for that purpose.
>
> **Limit on amount of information collected**
> **13(2)** A trustee shall collect only as much personal health information about an individual as is reasonably necessary to accomplish the purpose for which it is collected.

Use

Use of the personal health information by health care providers at the clinics will be for the purpose of providing health care to the individual including to monitor and manage the health and diabetes of the individual, which is the purpose for which it was collected (s. 21 of PHIA). Anonymized and aggregated

health information will be used by the Northern Health Region to conduct its community health needs assessment (project participants' health information will be included with all community members' health information) (s. 21(d) of PHIA). The following provision of PHIA provides authority for the use of PHI in these circumstances:

> **Restrictions on use of information**
>
> **21** A trustee may use personal health information only for the purpose for which it was collected or received, and shall not use it for any other purpose, unless
>
> (a) the other purpose is directly related to the purpose for which the personal health information was collected or received;
>
> (d) the trustee is a public body or a health care facility and the personal health information is used
>
> (i) to deliver, monitor or evaluate a program that relates to the provision of health care or payment for health care by the trustee, or
>
> (ii) for research and planning that relates to the provision of health care or payment for health care by the trustee;

> **Limit on amount of information used or disclosed**
>
> **20(2)** Every use and disclosure by a trustee of personal health information must be limited to the minimum amount of information necessary to accomplish the purpose for which it is used or disclosed.

Disclosure

Disclosure of the personal health information would be authorized for the following purposes:

- Disclosure for a health care purpose to a person who is or will be providing or has provided health care to the individual (s. 22(2)(a) of PHIA)
- Disclosure with the consent of the individual (s. 22(1)(b) of PHIA)
- Disclosure to a researcher at University of Manitoba to conduct research with de-identified health information (s. 22(2)(f) and 24 of PHIA)

The disclosure of personal health information in the circumstances as noted above is authorized under the following provisions of PHIA:

> **Individual's consent to disclosure**
>
> **22(1)** Except as permitted by subsection (2), a trustee may disclose personal health information only if
>
> (b) the individual the information is about has consented to the disclosure.

> **Disclosure without individual's consent**
>
> **22(2)** A trustee may disclose personal health information without the consent of the individual the information is about if the disclosure is
>
> (a) to a person who is or will be providing or has provided health care to the individual, to the extent necessary to provide health care to the individual, unless the individual has instructed the trustee not to make the disclosure;

(f) in accordance with subsection 22(2.2) (disclosure to another government), section 23 (disclosure to patient's family), section 23.1 (disclosure to religious organization), section 23.2 (disclosure for fundraising), section 24 or 24.1 (disclosure for health research) or section 25 (disclosure to an information manager);

Disclosure for health research

24(1) A trustee may disclose personal health information to a person conducting health research if the research has been approved under this section.

Who may give an approval?

24(2) An approval may be given by

(a) the health information privacy committee established under section 59, if the personal health information is maintained by the government or a government agency; and

(b) an institutional research review committee, if the personal health information is maintained by a trustee other than the government or a government agency.

Conditions for approval

24(3) An approval may be given under this section only if the health information privacy committee or the institutional research review committee, as the case may be, has determined that

(a) the research is of sufficient importance to outweigh the intrusion into privacy that would result from the disclosure of personal health information;

(b) the research purpose cannot reasonably be accomplished unless the personal health information is provided in a form that identifies or may identify individuals;

(c) it is unreasonable or impractical for the person proposing the research to obtain consent from the individuals the personal health information is about; and

(d) the research proposal contains

(i) reasonable safeguards to protect the confidentiality and security of the personal health information, and

(ii) procedures to destroy or remove, at the earliest opportunity consistent with the purposes of the research, any information that, either by itself or when combined with other information available to the holder, allows individuals to be readily identified.

Agreement required

24(4) An approval under this section is conditional on the person proposing the research project entering into an agreement with the trustee, in accordance with the regulations, in which the person agrees

(a) not to publish the personal health information requested in a form that could reasonably be expected to identify the individuals concerned;

(b) to use the personal health information requested solely for the purposes of the approved research project; and

(c) to ensure that the research project complies with the safeguards and procedures described in clause (3)(d).

3. **Source and accuracy of personal (health) information** *Briefly describe who is providing the personal (health) information to your program. For example, is it the individual or another source such as a government department or a family member? How do you ensure that the information received is accurate? How do you ensure the information remains accurate and can be updated?*

PHIA states:

Source of information

14(1) Whenever possible, a trustee shall collect personal health information directly from the individual the information is about.

Exceptions

14(2) Subsection (1) does not apply if

(a) the individual has authorized another method of collection;

For the purposes of our project, personal health information is obtained directly from the individual and not from a family member or another RHA or government department. Patients will provide their food order history data and their glucose monitoring information gathered by their wearable device that is stored on their smart phone to their health care provider (if glucose monitoring data is not collected directly from the patient, the collection from another source (Dexcom) may be authorized by the patient (s.14(2)(a) of PHIA).

4. **Notification statements** *Please provide a sample of your privacy notification statement(s) used to inform individuals about the collection, use and disclosure of their personal (health) information, your legal authority, and contact information for questions. Indicate if you think any changes need to be made or the statements updated.*

Notice of collection is required under s. 15(1) and (2) of PHIA:

Notice of collection practices

15(1) A trustee who collects personal health information directly from the individual the information is about shall, before it is collected or as soon as practicable afterwards, take reasonable steps to inform the individual

(a) of the purpose for which the information is being collected; and

(b) if the trustee is not a health professional, how to contact an officer or employee of the trustee who can answer the individual's questions about the collection.

Exception if information already provided

15(2) A trustee need not comply with subsection (1) if the trustee has recently provided the individual with the information referred to in that subsection about the collection of the same or similar personal health information for the same or a related purpose.

Personal Health Information Disclosure Statement: as per Northern Health Region (trustee):

As part of receiving or providing health care services at a site within the Northern Health Region; we only collect, use and disclose your personal information and personal health information as permitted by The Personal Health Information Act (PHIA) and The Freedom of

Information and Protection of Privacy Act (FIPPA). These Acts require Northern Health Region to protect the privacy of your information.

Part 4: Access rights for individuals

Under PHIA, individuals have a right to:

- request access to and obtain a copy of their personal (health) information held by a public body or trustee, and
- request a correction.

Ability to provide an individual access to their own personal (health) information held in either an electronic or hard copy system *Explain how you will provide individuals with access to their own personal (health) information, including how you will provide copies if requested. Describe how you will correct personal (health) information of an individual if required.*

The health centres have assigned a privacy officer who addresses all requests for information. All requests for information go through the privacy officer except for simple things like a print out of blood work results, an immunization record or other straight forward requests. In this case, the provider simply prints out the requested information and provides the info. It is the responsibility of the patient to communicate any changes related to contact information and personal identifiers that are stored in the clinical record. Broader requests for information are completed by the client who fills out an e-chart form and it is sent to MB e-chart to process. Access policy in the health centre is as follows:

Accessing Personal Health Information Policy

Request During an Appointment

If the client is attending the Health Centre for a healthcare appointment, they may ask the health care provider to show them the information on the screen or to print a copy of specific information **related to the visit** such as an immunization record - if they are there to receive an immunization. If client is requesting to view information not related to the visit, follow the process for eChart Manitoba Request (below).

Accuro Request

All information contained in Accuro is viewable through eChart Manitoba, therefore all requests to view information in Accuro will go through the eChart Manitoba request process.

eChart Manitoba Request

Step 1 – Request is Received
☐ **Client** requests access to personal health information
☐ **Health Care Provider** directs client to the **Privacy Officer**
Step 2 – Complete Request Form
☐ **Privacy Officer** provides **Request to Access Your Personal Health Information in eChart Manitoba** form (attached) & **Request to Access Your Personal Health Information Instructions** form (attached) to client
☐ **Privacy Officer** provides assistance to complete form, if required
☐ **Client** completes & signs form
☐ Completed form is reviewed by the **Privacy Officer** to ensure that it is fully completed & signed
☐ The **Privacy Officer** fulfills the request with 72 hours (3 days) if the information requests relates to health care currently being provided –
☐ If the information request relates to health care currently being provided & the Privacy Officer is not available, **Community Health Nurse 3** will fulfill the information request

Step 3 – Submit Request Form
☐ The **Privacy Officer** submits the form to eChart Manitoba if the information request does not relate to health care currently being provided
Step 4 – Information Request is Filled
☐ **eChart Manitoba** provides requested information directly to client
Step 5 – Explanation
☐ If the client requests an explanation of a medical term, code or abbreviation contained with the health record, assistance will be provided by a) the **original health care provider** or b) **Nurse Manager / Home Care Manager / Mental Health Manager / Community Health Nurse 3**, as appropriate

eChart MANITOBA

REQUEST TO ACCESS YOUR PERSONAL HEALTH INFORMATION IN ECHART MANITOBA

To receive a copy of your personal health information in eChart Manitoba, please:
- Fill in the appropriate fields in the form below and sign at the bottom
- Send the signed and completed form to the address or fax number on the bottom of this form
- OR submit the form directly to your health-care provider

PLEASE PRINT IN CAPITAL LETTERS: A B C 1 2 3

PART 1: ABOUT YOU

SECTION A: Please enter the following information about yourself or the individual for whom you are requesting information.

LAST NAME | FIRST NAME | MIDDLE INITIAL(S)

MAILING ADDRESS

APT / UNIT | STREET NUMBER | STREET NAME | POSTAL CODE

CITY/TOWN | PROVINCE | SEX (CHECK ONE) ☐ FEMALE ☐ MALE

DAYTIME TELEPHONE NUMBER | CELL PHONE NUMBER | BIRTHDATE (DD/MM/YYYY) | PERSONAL HEALTH IDENTIFICATION NUMBER (PHIN) (9-digit number on your Manitoba health card)

SECTION B: If you **do not** have a Manitoba Personal Health Identification Number, please fill in your health card number and issuing jurisdiction below.

HEALTH CARD NUMBER | PROVINCE, TERRITORY OR FEDERAL AUTHORITY

SECTION C: If you are **acting on behalf of another individual**, complete the following section with **your** information. If you are requesting the personal health information of a minor, both parents or guardians may be asked to provide consent. See page two, section C of this form.

LAST NAME | FIRST NAME | DAYTIME TELEPHONE NUMBER

MAILING ADDRESS (IF DIFFERENT FROM ABOVE)

APT / UNIT | STREET NUMBER | STREET NAME | POSTAL CODE

CITY/TOWN | PROVINCE

Why can you request this individual's information? (See page two for details)

PART 2: ABOUT YOUR REQUEST: Please select the type of medical information you are requesting from eChart Manitoba, as well as the dates from which you would like to receive information. EChart Manitoba Services may contact you for more information. **Please note:** You may be required to pay a fee per printed page.

	FROM (DD/MM/YYYY)	TO (DD/MM/YYYY)		FROM (DD/MM/YYYY)	TO (DD/MM/YYYY)
☐ Immunization information			☐ Diagnostic image reports		
☐ Medication history			☐ Encounters from St. Boniface Hospital		
☐ Laboratory information			☐ Visit reasons from St. Boniface Hospital		

NOTES (OPTIONAL)

FOR INTERNAL USE ONLY

DATE RECEIVED | DATE REQUEST EXAMINED

NAME OF RESPONDENT

SIGNATURE OF RESPONDENT

PART 3: SIGNATURE

Please sign and date this completed form and return it to the address or fax number below or directly to your health-care provider.

DATE SIGNED (DD/MM/YYYY)

X

Your signature

ADDRESS: eChart Manitoba Services, c/o Manitoba eHealth, 300-355 Portage Ave, Winnipeg, MB, R3B 0J6
FAX NUMBER: (204) 926-9148
More information:
Web: www.connectedcare.ca/echartmanitoba
Phone (toll-free): 1-855-203-4528

Manitoba eHealth, Health. Connected.® Manitoba

Part 5: Privacy and Security Measures

The clinics used for this project will comply with the security requirements in PHIA (s. 18 and 19 of PHIA and requirements in the Personal Health Information Regulation under PHIA). These are as follows:

Duty to adopt security safeguards

18(1) In accordance with any requirements of the regulations, a trustee shall protect personal health information by adopting reasonable administrative, technical and physical safeguards that ensure the confidentiality, security, accuracy and integrity of the information.

Specific safeguards

18(2) Without limiting subsection (1), a trustee shall

(a) implement controls that limit the persons who may use personal health information maintained by the trustee to those specifically authorized by the trustee to do so;

(b) implement controls to ensure that personal health information maintained by the trustee cannot be used unless

(i) the identity of the person seeking to use the information is verified as a person the trustee has authorized to use it, and

(ii) the proposed use is verified as being authorized under this Act;

(c) if the trustee uses electronic means to request disclosure of personal health information or to respond to requests for disclosure, implement procedures to prevent the interception of the information by unauthorized persons; and

(d) when responding to requests for disclosure of personal health information, ensure that the request contains sufficient detail to uniquely identify the individual the information is about.

Additional safeguards for information in electronic form

18(3) A trustee who maintains personal health information in electronic form shall implement any additional safeguards for such information required by the regulations.

Safeguards for sensitive information

19 In determining the reasonableness of security safeguards required under section 18, a trustee shall take into account the degree of sensitivity of the personal health information to be protected.

1. Security safeguards

i. Administrative safeguards

All staff working at the Northern Primary Care Clinic or the Beatrice Wilson Health Centre, the two clinics involved in the patient research portion of our project, receive PHIA training at the time of their hiring. They are required to sign a PHIA pledge.

Policies regarding PHIA and the personal health information recorded in the electronic record have been written by the trustee, the Northern Health Region, and are shared by both clinics. These policies guide include:

- Access to personal health information
- Protection of privacy
- Security Safeguards

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- Consent
- Restrictions and Use of Disclosure

These policies follow the requirements as outlined in the Personal Health Information Act of Manitoba.

If an individual working at a primary care clinic breaches PHIA, their regulatory bodies will be notified, and those bodies will follow their policies with that professional institution. The clinics will also notify the patient and follow their policies, as mentioned above, in this regard.

ii. Technical safeguards

The electronic medical record is utilized by trained internal staff who have signed the PHIA confidentiality form. Staff are granted access to the record only on an as needed basis. There are various levels of access so that some staff have limited access to information. All individuals utilizing the system have profiles and passwords associated with their access level.

Personal information is used to complete orders within the business unit and deliver orders to the individual's location of choice within the community. This information is stored and accessed in the server data base.

Personal health information in the health clinics is used by health professionals to respond to patients request for care and accessed via the electronic medical record via a password.

Personal health information is shared with other health professionals through referral within the standards of best practice.

iii. System audit functions

The Audit for Security Safeguards policy for the Northern Health Region EMR ensures that as a trustee of personal health information under PHIA, the Northern Health Region shall conduct an audit of security safeguards at least every two (2) years.
Dexcom operates under the U.S. Health Insurance Portability and Accountability Act (HIPPA) of 1996. They provide yearly audits of their information systems security practices.

2. The location of the personal (health) information

Information is held on the Electronic Medical Record server of which the Northern Health Region is the trustee.

3. Will any personal (health) information be stored by organizations outside Manitoba? Canada?

All personal health information is held within the electronic medical record at the health clinics and would only be shared outside of Manitoba if the individual required a referral to medical services that are not available in Manitoba.

Dexcom is a U.S. company that has the Canadian approved technology for continuous glucose monitoring that we will consider using for this project. As mentioned above, Data collected from the continuous glucose monitoring device, manufactured by Dexcom, will be sharable with the healthcare provider through Dexcom's proprietary Clarity software. Dexcom provides secure, cloud based, storage of user data using AES-256 encryption and data transmission encryption using a minimum of

TLS 1.1. Dexcom operates under the U.S. Health Insurance Portability and Accountability Act (HIPPA) of 1996. Further information about the data security management of Dexcom Clarity software can be found in APPENDIX B.

4. Records retention and destruction

The clinics chosen for this project will comply with the requirement to have a retention and destruction policy as required by s. 17(1) of PHIA).

> **Retention and destruction policy**
> **17(1)** A trustee shall establish a written policy concerning the retention and destruction of personal health information and shall comply with that policy.

As per the Northern Regional Health policy, information on the individual's patient health care record on the EMR must be retained for 12 years. This is applicable for both paper and electronic records. Information collected on participants in the study group, for the purpose of research, will be destroyed after the study is completed, unless it is required as part of the permanent record of the patient, such as laboratory results.

5. Information Managers

We do not plan to share information with another party.

Part 6: PIA Summary and Findings

In summary, as advised, we have reviewed the following documents and identified how our project demonstrates awareness of these processes and legislations and how we plan to comply with them.

- **Privacy Impact Assessment Tool**

We have highlighted details of our plan through completion of the Privacy Impact Assessment Tool as written above. We have identified how we plan to mitigate risks to the public as it pertains to the collection and sharing of their personal information as it relates to their interface with our planned project. As such, we have identified the following areas that must be considered:

- Data-minimization – we plan to collect, use and disclose only what is necessary for the customer to receive the goods and services that have identified as something they want and that they provide full consent for all information they share.
- De-identification – we plan to de-identify personal information wherever possible, such as package labelling with a bar and utilizing a scanner rather than having information on the package. Similarly, the health care follow-up and research will be done using the strict codes of ethics and research as established by the Canadian Institute for Health Research and the University of Manitoba, which includes de-identification as much as possible as well as early destruction of information collected when its use has expired. Additionally, this is only done with the individual's full knowledge and consent.
- Opt-out strategy – individuals may opt out of doing business with the smart farm at any time. Options for doing so may be that they opt-out of paying with a credit card and simply use an alternative such as preloading their account with cash at the smart farm. Alternatively, they

may cancel their account with the business at any time. For financial reasons, the business must keep record of any financial transactions for seven years, but any personal information is deleted.

- Data governance and Privacy Management program – our proposed business will be supported by a policy that ensures the administrator of the data required to operate the business of the smart farm and delivery system is aware and compliant with all personal information legislation and the importance of the confidentiality that each customer requires and can be ensured of receiving from the business regarding their information. The administrator will be the privacy lead and will report to the CEO or the business, who in turn reports to the Board of Directors of the business regarding auditing and compliance as well as managing breach of compliance. This will be supported by the policy. There are no other partners to consider as any other entities associated with the business are vendors and accessing their technology will also require agreements and conditions that support current legislation and controls.
- All health care data is protected by the PHIA legislation that governs health data. Two health clinics will be utilized for the purpose of working with and supporting individuals who wish to be participants in the study group. One health clinic, Beatrice Wilson Health Centre, is operated by Opaskwayak Health Authority. The other clinic, The Pas Primary Care Clinic, is located within The Pas Health Complex in The Town of The Pas and is operated by the provincial Northern Regional Health Region. Both clinics follow the PHIA legislation and all staff have received PHIA training and have signed agreements of confidentiality under this legislation. All patient data is stored on an electronic medical record, Accuro, and the data is shared between the two sites. The Northern Regional Health Authority is the trustee of this data. Each of the clinics has a privacy officer, responsible for maintaining confidentiality, auditing, and to whom individuals may go to regarding concerns or any real or perceived breaches of their confidentiality that they wish to discuss.
- Community engagement and project transparency – we have completed comprehensive community engagement strategies including:
  - Surveys – business and general population
  - Forums – special needs groups, business, leadership, health
  - Social media – Facebook
  - Scheduled feedback - groups that hold regular meetings and include Smart Cities on their agenda including governments, business, health, Boards
  - Focus groups – people living with diabetes, disabilities, high risk youth, elders
- Consent – individual consent is built into every step of our proposed project. Consent is necessary to access the server database of our business so that the individual may order and pay for food from the vertical farm and have it delivered to their door. They may also access food by driving to the smart farm and ordering it directly and paying for it in any method they choose, so it is not that this food is inaccessible if they do not provide personal information. Consent is also required if individual's wish to participate in the study or research project associated with our proposal. All information shared by the individual at the health clinic's is covered by PHIA and consent of patients under that legislation.

- **The Personal Health Information Act (PHIA)**

As per Manitoba legislation, PHIA provides access to information and protection of privacy rights concerning personal health information. PHIA allows individuals to examine and receive a copy of their own personal health information from a trustee holding this information. PHIA imposes obligations on trustees for the protection of personal health information, specifically its collection, use, disclosure and security. In our responses above, we have demonstrated that all personal working with individuals in our health centre or performing research in any way that is related to this project, must always have completed PHIA training and signed agreement to maintain patient confidentiality. This applies to all records, information and conversations that have anything to do with personal information of any sort.

- **Fair Information Principles**

The fair information principles, provided by the Manitoba Ombudsman's office and the Office of the Privacy Commissioner of Canada, have been considered in our business plan and will continue to be addressed as we proceed. These principles include:

- Be accountable
- Identify the purpose
- Obtain valid, informed consent
- Limit collection
- Limit use, disclosure and retention
- Be accurate
- Use appropriate safeguards
- Be open
- Give individuals access
- Provide individuals with an avenue for recourse

A detailed risk assessment of the personal information or personal health information of individuals involved in the project will be completed following the success of winning the Challenge and acquiring the funding to do so at that time.

2. Dexcom Clarity Information Security Policy

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Dexcom CLARITY® Information Security Management

The purpose of this document is to provide to potential Users a general description of the security management for the Dexcom CLARITY® software application.

General Description

The web-based Dexcom CLARITY® is a data management software application that allows the transfer of glucose data to remote servers for data management. Dexcom CLARITY® can transfer data from the Dexcom G4® Platinum CGM System and the Dexcom G5™ Mobile CGM System. Healthcare professionals in clinic settings, such as hospitals or medical offices (referred to as "Clinics" in this document), can use the Dexcom CLARITY® clinic portal accessible through the internet. Patients can also use Dexcom CLARITY® on their personal computers. After the glucose data is transferred to Dexcom CLARITY®, the information is processed by Dexcom and transmitted to Dexcom CLARITY® Users and displayed in charts and graphs to help Users analyze trends and patterns in glucose levels.

The computer and network requirements for using Dexcom CLARITY® are listed in the Dexcom CLARITY® User Guide: https://www.dexcom.com/guides.

Deployment Model

The User's personal computer (desktop or laptop) can be used to access Dexcom CLARITY® over the Internet. Dexcom hosts Dexcom CLARITY® on a secure cloud installation, eliminating hosting costs and complexity for the User.

- No peripheral hardware required
- Standard internet access to a specific set of IP addresses
- No interface with clinic medical records is required for a Clinic to operate Dexcom CLARITY®
- Data traffic is secured using TLS 1.1 or higher
- Data encrypted at rest using AES-256 encryption
- Data redundantly backed up across wide geographic separation
- Dexcom is a covered entity providing services to patients using Dexcom CGM systems; no business associate agreement is required for the exchange of patient information between Dexcom and Clinics as covered entities providing health care to the patient

Data Export

Patient data and reports can be exported by the User in PDF or CSV formats.

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Security Management for Dexcom CLARITY®

The following describes how the Dexcom CLARITY® clinic portal is secured, following the organization of ISO/IEC 27002:2013. The following summarizes security management for the Dexcom CLARITY® system, and does not discuss security for Dexcom CGM Systems.

System Layers

Responsibility for secure operation of Dexcom CLARITY® is shared between **Dexcom** and the **User** and where applicable, the **Clinic**: While Dexcom CLARITY® is designed for secure operation, effective security requires User and Clinic participation.

Security responsibilities are organized into the following System Layers:

System Layer	Description	Responsibility
Workstation	Desktop or laptop used to access Dexcom CLARITY®, including hardware, software, environment, and people.	User/Clinic
Application Use	Use of Dexcom CLARITY® application.	User/Clinic
Application Design	Design of Dexcom CLARITY® software.	Dexcom
Infrastructure	Servers, operating systems, network configuration, and supporting systems used to operate Dexcom CLARITY®.	Dexcom

Users

We use the following definitions in this document:

Users: Home Users and Clinic Users.

Home Users: Patients of Dexcom CLARITY®.

Clinic Users: Dexcom CLARITY® clinician users (both staff and administrator roles). Does not include Home Users.

Security Controls

The following tables describe Dexcom CLARITY® security management for each subsection of ISO/IEC 27002:2013. Each subsection provides a description of the responsibilities of Dexcom and the responsibilities of the Clinic regarding its Clinic Users and their use of Dexcom CLARITY®. Where appropriate, responsibilities are divided by System Layer.

Home Users are responsible for the security of their own Dexcom CLARITY® User account and the security of their network, computers and data.

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Information Security Policy

27002 Subsection	Dexcom Responsibility	Clinic Responsibility
Management direction for information security	Dexcom policies for information security are maintained within the Dexcom ISO 13485-certified Quality System.	Clinic is responsible for own information security policies.

Organization of Information Security

27002 Subsection	Dexcom Responsibility	Clinic Responsibility
Internal organization	Information Security responsibilities for Application Design and Infrastructure are maintained within the Dexcom Quality System.	Workstation and Application Use information security.
Mobile devices and teleworking	Management of mobile devices and teleworking for Dexcom employees is controlled by the Dexcom Quality System.	Management of mobile devices and teleworking for Clinic Users.

Human Resource Security

27002 Subsection	Dexcom Responsibility	Clinic Responsibility
Prior to employment	Background checks for all Dexcom employees and contractors with access to PHI.	Screening of Clinic Users.
During employment	Security policy for all Dexcom employees and contractors with disciplinary process for violation.	Management of Clinic Users.
Termination and change of employment	Access is revoked on termination of Dexcom employment or contract.	Access revocation on termination of employment for Clinic Users.

Asset Management

27002 Subsection	Dexcom Responsibility	Clinic Responsibility
Responsibility for assets	Management of assets for Infrastructure.	Management of Workstation.
Information classification	Policy for handling information in Infrastructure is maintained within the Dexcom Quality System.	Information classification for any materials exported from Dexcom CLARITY®.
Media Handling	No removable media is used within Infrastructure. All data encrypted at rest.	Responsible for removable media and encryption of Workstation.

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Access Control

27002 Subsection	Dexcom Responsibility	Clinic Responsibility
Business requirements of access control	Access to Infrastructure is on a need-to-have basis. Network access to Infrastructure is denied by default, and only explicitly allow.	Management of Workstation and Application Use.
User access management	Application Design: • mechanisms to allocate, remove, and review access rights for Clinic Users • mechanisms to manage Clinic User passwords Infrastructure: management of user access and passwords.	Workstation: management of user access and passwords. Application Use: allocation, removal, and review of access rights for Clinic Users.
User responsibilities	Dexcom employees and contractors with access to PHI receive training on their security responsibilities.	Security responsibility training for Clinic Users.
System and application access control	Application design: • implementation of login and access control mechanisms • logical partitioning of data between customers Infrastructure: Access is restricted to a secure VPN.	Access control for Workstation.

Cryptography

27002 Subsection	Dexcom Responsibility	Clinic Responsibility
Cryptographic controls	User data is encrypted in transit with TLS 1.1 using modern cryptographic algorithms (AES-128 or 3DES). User data is encrypted at rest using AES-256.	Workstation must provide modern web browser with modern cryptographic algorithms enabled.

Physical/Environment Security

27002 Subsection	Dexcom Responsibility	Clinic Responsibility
Secure areas	Physical security for Infrastructure is managed by an ISO 27001-certified datacenter.	Physical security of Workstation environment.
Equipment security	Equipment security is managed by an ISO 27001-certified datacenter.	Equipment security for Workstation.

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Operations Management

27002 Subsection	Dexcom Responsibility	Clinic Responsibility
Operational procedures and responsibilities	Policy and procedures are maintained in ISO 13485 certified Quality System, implementing Change management, performance and capacity management, and separation of production and test environments.	Policy and procedures for Workstation management.
Protection from malware	Infrastructure not accessible to end users with software installation performed by controlled systems.	Malware management for Workstation.
Backup	Infrastructure backed up daily with three redundant off-site copies on the East Coast. Yearly disaster recovery tests.	Disaster recovery for Workstation.
Logging and monitoring	Application design: mechanism for audit of user actions, including who performed the action, when the action was performed, and the IP of the user performing the action. Infrastructure: system exceptions, system activity, and authentication events for maintenance access are centrally logged. Server clocks are synchronized.	Logging and monitoring for Workstation.
Control of operational software	Infrastructure: software is centrally controlled using automation software.	Management of Workstation software.
Technical vulnerability management	Monthly vulnerability scanning of Infrastructure. Vulnerabilities are tracked and remediated according to Dexcom policy.	Vulnerability assessment and remediation for Workstation.
Information systems audit considerations	Dexcom performs yearly HIPAA audits of its information systems security practices.	Audits of Workstation management.

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Communications Security

27002 Subsection	Dexcom Responsibility	Clinic Responsibility
Network security management	Infrastructure is segregated from the internet in a private network with explicit entry points. No wireless networks are permitted within Infrastructure.	Workstation network security management. Internet connection of 1.5 Mbps or better.
Information transfer	Data transfer between Dexcom and third parties is controlled by policy and agreement.	Management of data transfer policy and agreement.

Systems Acquisition, Development and Maintenance

27002 Subsection	Dexcom Responsibility	Clinic Responsibility
Security requirements of information systems	Software security requirements are controlled as software requirements and analyzed as part of software risk management.	N/A
Security in development and support processes	Software requirements are tested as part of software verification. Development environment is secured according to Dexcom policy.	N/A
Test data	Test data is controlled on private environments.	N/A

Supplier Relationships

27002 Subsection	Dexcom Responsibility	Clinic Responsibility
Information security in supplier relationships	Relationships with third party suppliers for Infrastructure and Software Design are controlled by Dexcom policy. Dexcom's business associates execute business associate agreements with Dexcom. Appropriate confidentiality provisions are entered into between Dexcom and our customers and vendors.	Relationships with third party suppliers for Workstation.
Supplier service delivery management	Third party suppliers are qualified and managed in the Dexcom Quality System.	Service delivery management of third party suppliers for Workstation.

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Information Security Incident Management

27002 Subsection	Dexcom Responsibility	Clinic Responsibility
Management of information security incidents and improvements	Infrastructure and Software Design security incidents are investigated and reported to Dexcom Quality. Confirmed security breaches are reported to affected customers within 48 hours of confirmation.	Management of Workstation and Software Use security incidents.

Information Security Aspects of Business Continuity Management

27002 Subsection	Dexcom Responsibility	Clinic Responsibility
Information security continuity	Infrastructure and Software Design disaster recovery is managed by Dexcom procedure, with yearly tests.	Disaster recovery for Workstation.
Redundancies	Servers are configured for high availability using redundancy across datacenters.	Redundancy of Workstation.

Legal/Compliance

27002 Subsection	Dexcom Responsibility	Clinic Responsibility
Compliance with legal and contractual obligations	Acts as a covered entity under HIPAA, in accordance with 45 CFR 160.103. Dexcom can also receive PHI under 45 CFR 164.512(b)(iii), and in doing so we are not acting as a business associate. Dexcom follows applicable regulatory controls, laws, contract obligations and standards for the classification of data associated with Dexcom CLARITY®. Use of Dexcom CLARITY® is subject to the applicable terms of use and privacy policy available at www.dexcom.com.	Clinic acts as a covered entity under HIPAA. Clinic is responsible for compliance with its obligations under HIPAA and other regulatory controls, laws, contract obligations and standards applicable to Clinic and Clinic Users.
Information security reviews	Dexcom performs yearly HIPAA audits of its information systems security practices.	Audit of information security policy and procedures.

For technical assistance with CLARITY please contact Dexcom Technical Support: Telephone: 1-888-738-3646, Email: techsupport@dexcom.com
Web: www.dexcom.com Address: 6340 Sequence Drive, San Diego, CA 92121.

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3. Letter from the MB Ombudsman

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Manitoba Ombudsman

750 – 500 Portage Avenue
Winnipeg, MB R3C 3X1
Telephone: 204-982-9130
Toll Free in Manitoba: 1-800-665-0531
Fax: 204-942-7803
E-mail: ombudsma@ombudsman.mb.ca
www.ombudsman.mb.ca

500 av. Portage, Pièce 750
Winnipeg, MB R3C 3X1
Téléphone : 204-982-9130
Sans frais au Manitoba : 1-800-665-0531
Télécopieur : 204-942-7803
Courriel : ombudsma@ombudsman.mb.ca
www.ombudsman.mb.ca

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March 1, 2019

Ms. Rose Neufeld
Team Lead
The Pas, Opaskwayak Cree Nation, and RM of Kelsey (Tri-Council Region)
Smart Cities Challenge Project

Re: Smart City Challenge Privacy Impact Assessment (PIA)

Dear Ms. Neufeld:

Our office has appreciated the opportunity to work with your group as one of the 20 Smart Cities Challenge finalists in the development of the 'Data and Privacy' components of your final proposal in the finalist phase of the competition.

Our office has reviewed your Preliminary Personal Health Information PIA and, in our view, it demonstrates your commitment to responsibly managing data through its lifecycle with security and privacy considerations addressed. We are satisfied that you have thoroughly considered the privacy implications of your project.

We wish you luck in the next phase of the Smart Cities Challenge.

Sincerely,

M. Cormier

Marc Cormier
Acting Manitoba Ombudsman

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4. Letter to the OPC

March 4, 2019

Ms. Nishi Malik, JD
Senior Advisor, Business Advisory Directorate
Policy and Promotion Sector
Office of the Privacy Commissioner of Canada
655 Bay Street, Suite 404
Toronto, ON M5G 2K4

Dear Ms. Malik,

Re: Smart Cities Challenge Finalist: Town of the Pas, Opaskwayak Cree Nation, RM of Kelsey

Thank you for reading the initial "PIPEDA – Preliminary Privacy Impact Assessment" document which was submitted to you on our behalf by the Manitoba Ombudsman's office. We appreciate the time you took to review our submission and provide us with your comments. The template your comments were provided on is most informative in helping us understand, in detail, the requirement of the preliminary PIA document. Upon review of your comments, we have revised our document to reflect more clearly how the commercial activities proposed in our project intend to meet the requirements established in the PIPEDA legislation. We have enclosed a copy of the revised document for your information.

We recognize that this is a preliminary document and upon implementation of our project, we will contact you and complete a comprehensive privacy impact assessment.

Thank you for your support of our project and we look forward to working with you in the future.

Sincerely,



Rose Neufeld, Project Coordinator
Tri-Council Smart Cities Challenge Finalist

Enc:

cc Ms. Linda White, Investigator, Manitoba Ombudsman's Office

5. OPC PIPEDA-PPIA

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Office of the Privacy Commissioner of Canada
PIPEDA- Preliminary Privacy Impact Assessment

Name of the Project
The Tri-Council Region Smart Cities Challenge

Names of project representatives
Rose Neufeld, Derek Neufeld, Glen Ross, Jim Berscheid, and Chad Zolinski

Date Completed
February 25, 2019

EXECUTIVE SUMMARY
Opaskwayak Cree Nation, The Town of The Pas, and The Rural Municipality of Kelsey in Manitoba have entered into an informal relationship through a friendship accord and work together to address issues common to each of their respective governments to build a better future for generations to come.

We have entered the Smart Cities Challenge, an initiative of Canada Infrastructure which called for project proposals using technology to address issues that face the community, including the internet of things, connected technologies, and big data. As a finalist in the Challenge, we are competing for a $10M award to implement our project.

Our project is directed at improving the health of community members through the provision of direct to door food distribution of locally grown food, produced at the Smart Farm, which can be ordered via a smartphone application.

As per federal regulation, the personal information protection and electronic documents act (PIPEDA) governs the collection, distribution, and use of personal information of Canadians by business entities in the course of commercial activity. Given that this project includes the operation of a business that will undertake collection of personal information from community members, the Office of the Privacy Commissioner of Canada (OPC) has been consulted on implementation of personal information collection, distribution, and use principles that will need to be addressed in the implementation phase of this project. To date, feedback has been provided by OPC on a preliminary submission of data management policies, and this feedback has been incorporated into the development of this preliminary privacy impact assessment for the project proposal. Further consultation will be initiated with the OPC through the implementation phase to ensure this project's commercial activities are compliant with federal legislation.

BACKGROUND
This new program is being implemented because currently, and historically, access to healthy food is very difficult for our community, located in northern Manitoba. The distance that food must travel to reach our community results in high costs, low quality and early spoilage rates. This makes it difficult for many of our community members to purchase fresh food to feed their families. This has resulted in many families

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including little or no fruits and vegetables in their daily diet. The project we are implementing will assist in making food available and the study we are proposing will create a base of knowledge and a core group of individuals that become aware of the link between physical biometrics such as blood glucose levels and consumed foods. Our goal is to reduce the rates of diabetes and provide our community members with options to attend to their health through accessibility to healthy foods.

We are utilizing technology to help us address the problem of adequate food supply knowing that new and innovative measures are required as the current means of acquiring healthy food is not addressing the increasing poor health statistics in our community.

GENERAL

As discussed in our accompanying Chapter 7 in which this PIA is referenced, the commercial activity detailed in our proposal for the Smart Cities Challenge occurs between the community members (customer) and the not-for-profit corporation (to be established in the implementation phase, herein referred to as the NFP). The customer, through the smart phone application, which will be developed upon success in the Challenge, creates an account which requires submission of personal information to the NFP including their name, address, contact information, and optionally payment. Upon creation of an account, the customer can view the product list, recipe list, their order history and their order status after they have completed a purchase. Placement of an order requires submission of payment information through the application or pre-loading of their account through cash deposits at the plant factory location. Their order is identified by a transaction number and a transaction receipt is issued.

Upon success of our proposal, we will be completing a more comprehensive privacy impact assessment by utilizing the federal privacy impact guidelines and other resources including the PIPEDA Privacy Assessment tool. We recognize that the elements that require consideration when we implement the project include:

- Be accountable
- Identify the purpose
- Obtain valid, informed consent
- Limit collection
- Limit use, disclosure and retention
- Be accurate
- Use appropriate safeguards
- Be open
- Give individuals access
- Provide individuals with an avenue for recourse

PROJECT PIPEDA BOUNDARIES

Personal Information:

Upon downloading the smartphone application used for placement of order to the NFP, customers will be required to create an account before they can access information and resources provided by the application. Creation of an account will involve the **collection** of personal information and is thus subject to PIPEDA

considerations. The minimal amount of personal information needed in order to effectively deliver services will be collected. Personal information items that will be collected by the application include:

- Name
- Address
- Contact information
- Payment information
- Order details

This information will be **used** by the NFP for internal business operations including:

- Packaging identification
- Product identification
- Location of order delivery

Information will only be provided to employees of the the NFP on a need to know basis, in further pursuit of compliance with PIPEDA.

There are two methods that will be available to customers for processing payment; credit card or preloaded account balance. Preloading of the customer's account can occur by depositing cash or cheque at the plant factory. However, processing of credit card payments requires the **disclosure** of personal information to the financial institution in order to process the transaction.

It is understood that any personal information **collection** or **disclosure** event must solicit the express consent of the customer in order to ensure compliance with PIPEDA legislation. In pursuit of compliance with this legislation, a notice of data collection window will be displayed to the customer upon prompting the creation of an account with the NFP and must be agreed to prior to submission of any personal data. Secondly, a notice of disclosure window will be displayed, and must be acknowledged by the customer, prior to processing any transaction via credit card to ensure informed consent regarding NFP's required **disclosure** of personal information to perform this activity.

Customers will, at any time, be able to delete their account with the NFP through the smartphone application interface, thus deleting the existence of their personal information from the customer database. However, in compliance with financial legislation, there will be a record kept of any purchase transactions that the customer processed with the NFP. Furthermore, under PIPEDA legislation, customers have the right to request a copy of their personal information or request a correction of this information held by a business entity at any time. This will be observed by the following two measures:

1. Customers have 24-hour access to their personal information held on the NFP server through the smartphone application
2. Customers can contact the manager of the NFP in order to access their personal information

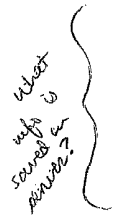
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The smartphone application required for this project currently does not exist. Therefore, a software development contractor will be hired for the purposes of creating the required software solution. Furthermore, this company may be used from time to time to provide application updates to ensure compatibility with future operating system releases or to increase/modify features incorporated into the smartphone application. However, there is no anticipated disclosure of personal information through this process. To make this delineation clear, the following is a brief overview of the software architecture.

The smartphone application software will operates using three components:

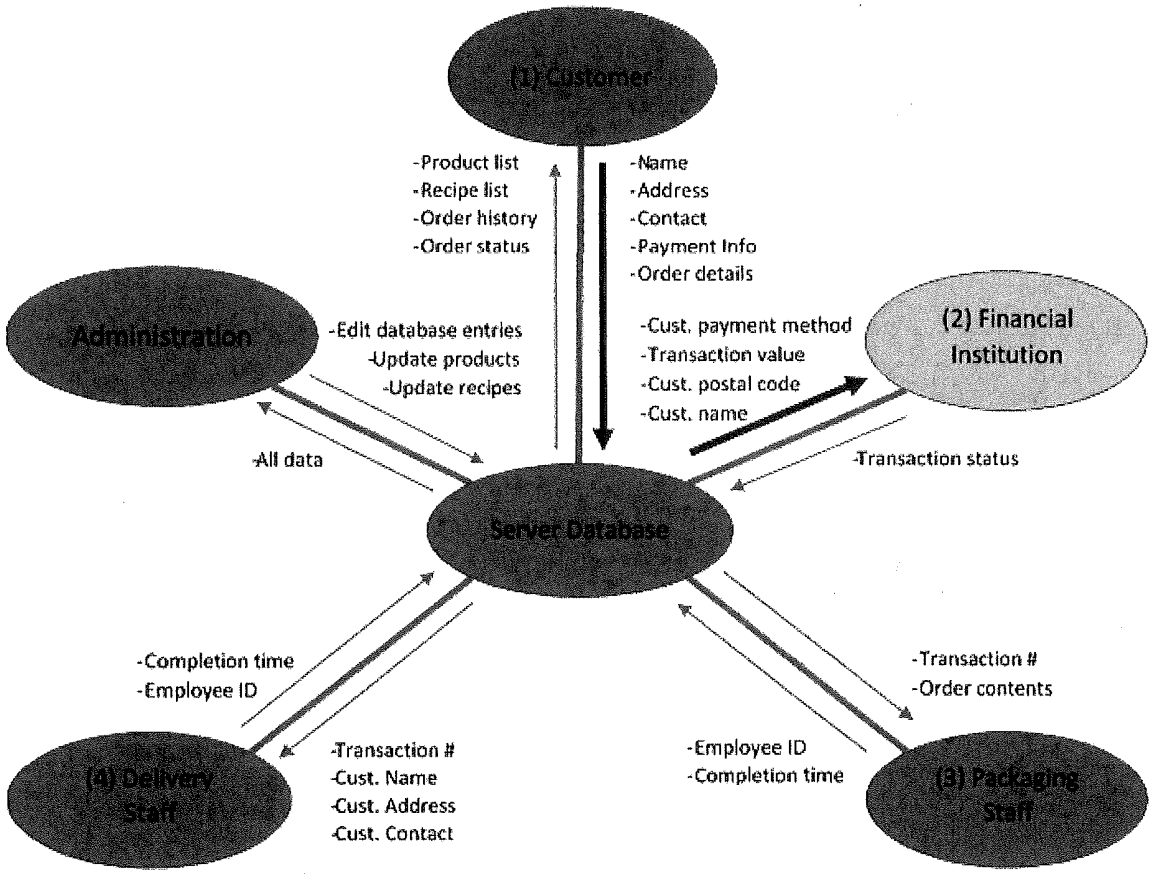
- A frontend application
- A backend application
- An information database

The frontend application is the smartphone application that customers will download and run on their smartphone. This application will be placed on the Android Play store and the Apple Store so that it is easily accessed by all who desire to use the services of the NFP. The backend application resides on a server that will be located on the NFP business premises. The frontend application communicates with the backend application over the internet. The function of this backend application is to process commands and translate/organize information stored within the database so that it is correctly displayed on the smartphone application. To ensure data security at the place of residence, user information will be encrypted on the server hard-drive. To ensure data security within all internet-based communication links, industry standard TLS encryption will be used.



The software developer will create the code for the frontend application, the backend application, and the framework for the information database. During the development of these codes, or during the updating of these codes at a future date, the software developer does not require access to the database, they only require access to the frontend application and/or the backend application. Consequently, there is no disclosure of personal information to this third party at any time.

Personal Information Flow:



Disclosure Statement:

A notice of personal information collection statement must be agreed to by the customer prior to the NFP's collection of personal information. This statement will be displayed when the customer initiates account creation within the NFP's smartphone application. An example of a notice of personal information collection statement is:

By continuing with the creation of an account with the NFP corporation, you are agreeing to the collection and use of your personal information for the purposes of providing the services that the NFP corporation is offering.

A notice of personal information disclosure statement must be agreed to by the customer prior to the processing of payments for food products offered by the NFP. This statement will be displayed every time the customer initiates payment using a credit card as this requires disclosure of personal information to the financial institution. An example of a notice of personal information disclosure statement is:

By continuing, you understand and agree that your Name and Postal code will be disclosed to the financial institution for the purposes of processing the transaction.

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CONCLUSIONS

OPC has developed resources that will prove valuable to a comprehensive completion of a PIA when we enter the implementation phase of our project. Documents that will be utilized to accompany the PIPEDA privacy law include the PIPEDA Self-Assessment Tool, the Privacy Toolkit for Businesses, Issue-specific guidance for businesses and PIPEDA compliance and training tools. It is our goal to follow all regulations pertaining to the protection of personal information in this project.

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6. OPC PPIA Assessment

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Commissariat à la protection de la vie privée du Canada | Office of the Privacy Commissioner of Canada

Smart Cities Challenge 2019

Preliminary Privacy Impact Assessment Form

Finalist: Town of The Pas, Opaskwayak Cree Nation, Rural Municipality of Kelsey, Manitoba

1. Description of personal information or personal health information to be collected, used or disclosed (CUD)	Yes	No	Partially
			✓

Comments:

- Our Office received the PPIA documents on February 26th. As such, we did not have sufficient time to review any other documents provided by the finalists other than "Chapter 7: Data and Privacy" and "Appendix B" what is this document?
- Finalist discusses personal information it intends to collect and use.
- Unclear about disclosure of personal information. Finalist states: "No disclosure of any information outside of the business units will occur." Explanation would be helpful on who these business units are (if they are internal to the owner/manager of the app and/or the smart farm), what personal information is disclosed to them and for what purpose (i.e. a transaction service which supports the processing of payments, a delivery service who would need addresses to deliver food, etc.).
- Finalist discusses importance of minimizing collection of personal information; provides alternatives such as paying for products in cash versus using a credit card.

2. Information flow map that outlines each CUD of personal information or personal health information, with a corresponding legal authority for each flow	Yes	No	Partially
			✓

Comments:

- Consider providing the flow of personal information in a diagram or a table. It might be a helpful way to communicate the personal information involved in the vertical smart farm sales processes (setting out what information will flow to what party, based on what conditions). Example:

What data?	Data Flows to?	Cause of flow
Name Address Phone Number Email Address	Mobile application	Entered into app by user
Name Address Phone Number Email Address	Food delivery service	Food order made by user

This evaluation is completed with regard to Page 27 of the Smart Cities Challenge Finalist Guide.

Credit Card Information		
X	Tri-Council Not-for-Profit Management Corporation	Z

...and so on.

This is not necessary to include in the PPIA, but it would help to provide clarity for the various services being offered through the app.

- As discussed above in section 1, please illustrate flow of personal information in relation to any disclosures.
- Would any personal information be collected from, used by or disclosed to Tri-Council Not-for-Profit Management Corporation? If so, please explain under what circumstances.
- Would any personal information be collected from, used by or disclosed to Opaskwayak Cree Nation? If so, please explain under what circumstances.
- Would any personal information be collected from, used by or disclosed to Northern Regional Health Authority? If so, please explain under what circumstances.
- Identify all parties besides the user who have access to the user's personal information.
- Who is creating the app, and does that party have access to the personal information, does it retain or manage the personal information? If so, identify the app developer and their role and responsibilities in relation to the personal information. Consider entering into a contractual agreement with the app developer/manager to ensure that it handles personal information in compliance with PIPEDA. The agreement should include language that restricts their use of the personal information to tasks they are contractually obligated to complete and nothing more. This engages several PIPEDA principles including Accountability and Limiting Use, Disclosure and Retention.
- Who owns the server and who has access to it? What personal information will be stored in the server?
- Note: there is a reference to accessing the technology of vendors (Pg 4). Did you mean that these vendors would be accessing your technology?

3. Description of who you will collect personal information or personal health information from to enable the project with assessment of that person's authority to disclose the information	**Yes**	**No**	**Partially**
		✓	

Comments:

- Although the finalist indicates the user will be providing the personal information directly, no explanation is provided about the consent process. Further explanation provided below in Section 5.
- As mentioned above, need to know whether or not any personal information is being provided by any third parties. If so, explanation needed to understand what authority that third party has to disclose the personal information i.e. do they have consent from the individual to make the disclosure?

4. Information governance plan	**Yes**	**No**	**Partially**
			✓

Comments:

This evaluation is completed with regard to Page 27 of the Smart Cities Challenge Finalist Guide.

- The finalist states that it intends to develop a privacy policy.

5. Organizational privacy management framework, including related organizational access, correction, privacy and security policies	Yes	No	Partially
			✓

Comments:

Terms of Use

- Finalist indicates that app users will be required to agree to **Terms of Use**. Terms of Use are not an appropriate method of informing users about how their personal information may be collected, used and disclosed and obtaining their consent to same. The Disclosure Statement provided in Appendix B is more appropriate. Did you mean that app users will see and read the Disclosure Statement before they use the app for the first time?

Is this different from notice

Consent principle:

- The above comments tie in with obtaining the individual's consent for collection, use and disclosure of their personal information. The principles requires the consent and knowledge of the person and to make consent meaningful, the purpose must be stated in a manner that the person can reasonably understand

Identifying Purpose principle:

- Per the PIPEDA principle of Identifying Purpose, users must understand before or at the time of collection, why their personal information is required. Consider providing users with information, prior to the time of account creation, what personal information they will be required to provide, how it will be used, how it will be disclosed, to whom, and why.

6. A plan that outlines the way in which you will consider privacy and security risks throughout the process including to complete a comprehensive PIA	Yes	No	Partially
	✓		

Comments:

- Finalist considers and addresses some risk mitigation practices.
- Finalist notes that personal information will be transmitted through a server and will be encrypted.
- Finalist also notes that communication will be encrypted. Unclear as to what communication entails.
- Recommend a privacy policy that is easily accessible to users. Be sure to include the name and contact information of the person to whom any questions about privacy procedures can be directed.
- There is discussion about vendors involved who will be involved with this project. We recommend you consider entering into contractual agreements with them in which they agree to safeguard the personal information disclosed to them accordance with applicable privacy legislation, and they only use the personal information as is permitted by the contractual arrangement.
- Recommend PIPEDA-related privacy training for all staff (including packaging and delivery staff) involved with the business that relates to their obligations under PIPEDA
- Finalist identifies a retention period of 7 years for financial transactions and indicate that personal information will be deleted, however finalist does not identify when the personal information will be deleted. Is the financial transaction record devoid of all personal information?
- Should the application be successful, we would invite the finalist to work with us to ensure that the "10 Principles" of PIPEDA are accurately interpreted and properly applied.

This evaluation is completed with regard to Page 27 of the Smart Cities Challenge Finalist Guide.

PRIVACY IMPACT ASSESSMENT

PROJECT	Net Energy Zero Housing Project
ORGANIZATION	Cree Nation of Eastmain
PROJECT LEAD	[redacted] Director General

1. BACKGROUND

The Cree Nation of Eastmain (CNE) is a finalist in the Smart Cities Challenge. It proposed to create a Net Zero Energy housing program to respond to its critical housing shortage. As part of its proposal, the CNE must consider the privacy implications and its plans for ensuring privacy compliance.

Eastmain is located in Northern Quebec along the eastern shore of the James Bay.

2. LEGISLATIVE AUTHORITY

The CNE is a Cree First Nation. Pursuant to the *Agreement on Cree Nation Governance Between the Crees of Eeyou Istchee and the Government of Canada*, the CNE acts as a local government authority in Eastmain. It administers the assets of the First Nation, manages the land and the buildings and establishes, delivers and administers programs and services for members.

An important program operated by the CNE is housing. The CNE constructs housing to rent to members and obtains loans through Canada Mortgage and Housing Corporation for social housing. In order to address the severe housing shortage, the CNE intends to establish a program that offers affordable private homeownership and rental housing and addresses some of the issues facing on-reserve housing.

The Agreement concerning a *New Relationship between the Government of Canada and the Cree of Eeyou Istchee* first addressed housing in the Cree communities. This agreement confirmed the powers of the First Nations to adopt by-laws with respect to housing.

Under the *Agreement on Cree Nation Governance Between the Crees of Eeyou Istchee and the Government of Canada*, the Cree Nation government receives and distributes funding paid to the CNE pursuant to the *James Bay and Northern Quebec Agreement*. As such, the criteria and information requirements of the NZE housing program are designed to comply with the Cree Nation Government's criteria for housing as non-compliance with such criteria will impact the CNE's eligibility for funding for housing.

The CNE is in the process of implementing an integrated management system auditable to ISO Standards; 9001:2015 Quality Management; 20000-1:2011 Information Technology Service Management; and 27001:2013 Information Security Management. It is therefore alive to the need for rigorous information and data management protocols that ensure personal and confidential information are properly collected, managed and stored.

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3. PROJECT DESCRIPTION

The Net Zero Energy (NZE) housing program ~~focusses~~ focuses on the construction of new single-family and multi-unit homes and retrofitting existing homes. The NZE housing program will complement the existing rental and social housing programs.

Key personal information will be collected to ensure that housing is allocated appropriately, reflects the needs of its members and their financial capacity.

In addition, the CNE has already conducted an inspection of existing homes to identify deficiencies. This information will be used to determine the homes that are suitable for renovations and NZE retrofitting. The information respecting these homes is relevant for determining which ones will qualify for retrofitting.

The NZE housing program will involve the participation of other organizations. These organizations are: (a) Concordia University and (b) McGill University. In addition, the CNE will engage engineering firms and contract with suppliers for the purposes of carrying out construction or retrofitting of the homes.

4. PROJECT ACTIVITIES

The NZE housing program will involve the collection, use and storage of various types of data.

Rental Housing

The CNE collects the information described below during the housing application process. All of the information is provided directly by the applicant or is obtained with the consent of the applicant. The information is collected solely for the purposes of administering the rental housing program (*Risk level 2*) and evaluating and prioritizing the housing application.

Information	Purpose	Risk
Name of applicant(s)	Identification	1
Status/Membership	Contractual obligation that social housing be attributed to members	1
Family size	Determine housing needs	1
Total household income	Determine rent	3
Health conditions	Determine special housing needs	3
Rental arrears	Determine eligibility for new housing	3
Credit rating	Verify capacity to pay	3

The CNE is required by the policies of the Cree Nation Government to collect and use certain personal information when allocating rental housing. Social housing is geared toward the financial capacity of occupants and is intended for lower income families.

The above information is collected by the Rental Housing Department (the "Department") when the member completes an application for rental housing and consents to a credit

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check. The information collected is used solely for the purposes of evaluating the applicant's request for housing and determining the applicant's capacity to pay.

Private Homeownership

Information	Purpose	Risk
Name of applicant(s)	Identification	1
Status/Membership	Contractual obligation that social housing be attributed to members	2
Family size	Determine housing needs	2
Loan information	Confirm ability to pay for the construction of house	3
Health conditions	Determine special housing needs	3
Rental arrears	Determine eligibility under policies	3
Credit rating	Verify capacity to pay	3

In order to purchase or construct a home, members must comply with CNE policies and Cree Nation Government policies governing the private homeownership program. This program enables members to obtain grants to assist with the construction. The CNE will be required to be informed of financing arrangements with financial institutions because these institutions often require the Cree First Nations to guarantee loans to their members.

The information collected from private homeownership applicants will be used solely for the purposes of administering this program and evaluating eligibility of the applicants.

Homes built under the private homeownership program will be subject to contracts between the homeowner and the builder. The CNE will be required to collect the below business information in order to ensure that builders qualify under the Cree Nation Government policies.

Information	Purpose	Risk
Business Name	Identification	1
Ownership	Policy requirement	1
Operational Structure	Policy requirement	1
Regie du batiment licence	Verify qualifications	1
Financial information	Confirm financial ability to build houses	3
Debts with CNE	Determine eligibility under policies	3

Many of the local builders are sole proprietorships or partnerships with few incorporated companies. All the information is collected directly from the builders or from third parties with their consent. Certain information is publicly available because of reporting requirements under Quebec law.

The above information is collected solely to determine builders' eligibility to construct homes under the private homeownership program.

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Retrofitting

The CNE intends to retrofit existing qualified homes to make these more energy-efficient. Retrofitting work may be done in-house by the Department or contracted out to local builders. There will be no exchange of personal information. Generally, the retrofitting work on existing homes will require limited entry into homes or contact with occupants as most work will be carried out on the exterior.

Partners

CNE is working with Concordia University and McGill University to measure the success of the NZE housing program. Concordia University will collect and analyse quantitative data while McGill University will collect and analyse qualitative data. Both partners are subject to their respective privacy policies and protocols (*Risk Scale 1*).

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Concordia University

Concordia University will carry out field monitoring and detailed modelling with respect to the NZE homes and retrofits in Eastmain.

The performance data will enable Concordia University and CNE to validate performance and improve the design, construction and operation of NZE homes. The field data will be collected for the purpose of measuring the actual net-zero energy of the houses and how occupants interact with and operate their NZE homes. The information collected is identified below and will not be used to make decisions about an identifiable individual (*Risk Scale 1*).

personal information

Information	Purpose	Risk
Address	Identification	1
Hygrothermal Performance	Research	1
Electricity Consumption	Research	1
Energy Performance	Research	1
Indoor Air Quality	Research	1
Thermal Conditions	Research	1
Energy Generation	Research	1

Information respecting indoor environmental quality will be shared with McGill University to assist in the qualitative analysis.

McGill University

McGill University will be conducting a qualitative study to determine the level of satisfaction of the occupants of NZE homes. McGill University will collect the information identified below directly from occupants except for certain quantitative data relating to the NZE homes that will be provided by Concordia University.

The information will be collected for research purposes and to determine the success of the NZE housing program from a social perspective. The information collected will not be used

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to make decisions affecting identifiable individuals (*Risk Scale 1*) but will assist the CNE in improving its NZE housing program.

Information	Purpose	Risk
Name	Identification	1
Family Size	Research	1
Address	Identification	1
House Model/Size	Research	1
Comfort	Research	2
Satisfaction	Research	1

The information collected by McGill University will be anonymized before being used for research purposes and before it is disclosed to any third parties in reports on the social success of the NZE housing program.

5. TERM

The NZE housing program is intended as a long-term program (*Risk Scale 3*). Data collection activities will be carried out throughout part of the program in order to measure success, identify concerns and deficiencies and adjust the program accordingly.

6. POPULATION

The information collection and use activities of the CNE NZE housing program will be limited to CNE members.

The personal information collected by the CNE will be used internally to administer its housing program. The information will be used to make decisions respecting the allocation of rental housing and the approval of grants for private homeownership. The information will therefore affect every applicant for rental housing or private homeownership (*Risk Scale 3*).

No personally identifiable information will be used or disclosed by Concordia University or McGill University. Reports prepared by the CNE and its partners on the success and details of the NZE housing program will be anonymized or will focus on technical aspects of the program.

7. TECHNOLOGY

The CNE recently made changes to its information technology system to ensure better functioning and security. The implementation of the NZE housing program will not require the introduction of new information technologies or software to support the collection, use or storage of personal information.

However, the NZE houses will be equipped with connective technology allowing Concordia University to monitor and measure field data and performance data. Moreover, most homes

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are already equipped with smart meters that provide accurate and up-to-date information on energy use.

8. INFORMATION TRANSMISSION

CNE, Concordia University and McGill University will collect, use and store information in different ways.

Cree Nation of Eastmain

Certain information about members is already maintained on the CNE information system including

(a) name,
(b) band number,
(c) date of birth, and
(d) address.

This information is required to access funding, ensure members can access programs and services offered by the CNE and by other Cree entities. The CNE information system is connected to the internet but the personal information is not shared electronically with any third party (*Risk Scale 2*).

The CNE uses paper application forms that members complete and submit to the Department (*Risk Scale 1*). The forms are kept in a secure place in the Department and the information is accessed solely for the purposes of allocating rental units and under the NZE housing program will be used also to process applications under the private homeownership program.

The CNE will not disclose information it collects to any third party except as required by law or policy. Only information relating to the addresses of NZE homes will be disclosed by the CNE to its partners, Concordia University and McGill University.

Concordia University

Concordia University will receive the personal information identified in section 4 electronically through connective technologies and this information will be analysed within its information system (*Risk Scale 2*). Other than the house address, no other personally identifiable information will be transmitted.

The information obtained and used by Concordia University will not permit the identification of an individual.

McGill University

McGill University will collect data directly from individuals at meetings, talking circles and other forums. The information collected will be used and stored on a closed system that has no connectivity to the internet or other systems (*Risk Scale 1*).

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Prior to any reporting, the information obtained by McGill University will be anonymized to prevent the identification of those individuals who participate in the forums.

9. RISKS

It is unlikely that a privacy breach in respect of the information collected by Concordia University or McGill University would impact the individuals concerned by the information.

A privacy breach of CNE-held information could impact the individual concerned by that information.

In the event of unauthorized or accidental disclosure or access, the CNE will notify the affected individual(s) and make efforts to mitigate the privacy breach by ensuring the employees responsible are given proper training and information in order to prevent future privacy breaches. Employees who intentionally access or disclose personal information may also be subject to disciplinary measures, such as suspension or termination, under CNE policies.

The CNE is also preparing policies respecting the classification of information and identifying the levels of access and protection required. Employees will be trained on these policies to ensure that information is treated according to its nature and degree of confidentiality.

10. ANALYSIS

The NZE housing program will involve the collection, use and retention of personal information, of varying degrees of sensitivity. The CNE intends to comply with fair information principles.

Accountability

Pursuant to the *Agreement on Cree Nation Governance Between the Crees of Eeyou Istchee and the Government of Canada* and the *Constitution of the Cree Nation of Eeyou Istchee*, the CNE must establish ~~establish~~ access to information procedures with respect to information in its control. The CNE is implementing a process for classifying information and establishing the level of protection required.

Presently, CNE agreements contain provisions respecting confidentiality and, with respect to service providers, retention and disclosure restrictions.

With respect to the NZE housing program, information collected by Concordia University and McGill University will be held be those institutions. CNE will only receive the results of the studies conducted by its partners which will not contain information allowing the identification of an individual.

Purpose

The CNE has held public meetings with its members in designing the NZE housing program. As well, housing continues to be tabled at public meetings. Members are informed regularly of the information requirements for housing. The new regional policies will be coming into

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force and the NZE housing program will involve further consultation with members. At these meetings, the CNE will inform members of the type of information that will be required and the purpose.

Prior to all collection of information, the individual is informed of the reasons for which the information is collected, how it will be used and whether it will be shared with other organizations.

Consent

The CNE collects and holds information relating to members under other programs. Unless the member consents to its disclosure to the Department, the CNE must request that information directly from the individual. As such, the CNE only uses personal information for the purposes for which it was originally obtained.

The name and address of the individual as well as information relating to membership are generally publicly known given the size of Eastmain. While the CNE may have a general understanding of certain health conditions, this information must be obtained directly from the individual or, if incapable, from that individual's caregiver.

Limit Collection

The information collected by the CNE will be that information required for the purposes of administering the NZE housing program and complying with the CNE housing policies and the policies to be adopted by the Cree Nation Government.

The information collected by Concordia University and McGill University is necessary to enable the analysis of the net-zero energy technologies, construction systems and to measure the success and individual satisfaction with the NZE homes to be built in Eastmain.

Limit Use, Disclosure and Retention

The information collected by the CNE will be used exclusively for the purposes of administering its housing program. The information collected will not be disclosed to third parties except as required by policy. Disclosure to the Cree Nation Government may be required under its policies and funding arrangements with the CNE. Otherwise, the CNE does not disclose information collected from members to third parties. Depending on the housing program, and the type of information collected, information is held for the duration of the housing project (i.e. until full payment) or until it is no longer relevant (such as a change of occupant).

Information collected by Concordia University and McGill University will be used solely for research purposes. No information will be disclosed that relates to an identifiable person. Generally, the information obtained by these institutions will be anonymized before it is disclosed to the CNE.

Accuracy

Because personal information is collected for the purposes of administering the housing program, it is important that it be accurate and up-to-date. Under CNE policies personal

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information must be updated every two years to ensure its accuracy. Individuals may also periodically update or modify their information as required.

Safeguards

The CNE implemented an integrated management system auditable to ISO Standards; 9001:2015 Quality Management; 20000-1:2011 Information Technology Service Management; and 27001:2013 Information Security Management. It therefore has put in place information and data management protocols to ensure that personal and confidential information are properly collected, managed and stored.

Openness

The CNE regularly holds public meetings at which its members are informed of policies, laws and programs. The NZE housing program and the housing policies have been discussed at these meetings to ensure that members understand the information requirements and the processes and policies surrounding the collection, use and retention of their information.

Access

Under the *Constitution of the Cree Nation of Eeyou Istchee*, the CNE must set up a process to respond to access to information requests. This will include identifying the person who will respond to such requests. Presently, members attend the CNE administration offices to request access to information and documents held by the CNE.

Individuals may access information pertaining to them to ensure its accuracy and make corrections. Generally, this is done directly with the department holding the information.

Grievances

Presently, if an individual believes that information held by the CNE is inaccurate or is used in a manner that is prejudicial a grievance can be made directly to the department head. If the matter is not resolved, then the matter is usually brought to the Director General or Council. This is an informal process. As mentioned above, the CNE must establish an access to information procedure that will also include a complaints procedure.

CONCLUSION

Any questions concerning this Privacy Impact Assessment may be addressed to the Project Lead.

Processed under the provisions of the Access to Information Act /Révisé en vertu de la Loi sur l'accés à l'information

Commissariat à la protection de la vie privée du Canada | Office of the Privacy Commissioner of Canada

Smart Cities Challenge 2019

Preliminary Privacy Impact Assessment Form

Finalist: Cree Nation of Eastmain

1. Description of personal information or personal health information to be collected, used or disclosed (CUD)	Yes	No	Partially
			✓

Comments:

Overall:

- Distinguish "personal information" from "non-personal information" with respect to collection, use and disclosure and specify what you determine to be personal information or personal health information. Note that PIPEDA does not cover personal health information. As such, the OPC is not in a position to comment on your reference to "health conditions" in the top table on Page 3. However, we suggest you create a separate category for personal health information, explain what that category specifically includes (i.e. health conditions of applicants), and clearly describe when personal health information is being collected, used or disclosed.

Collection

- With the following sentence in section 4, "[a]ll of the information is provided directly by the applicant ***or*** is obtained with the consent of the applicant", it appears CNE considers it adequate consent when information is obtained directly from the applicant. That is not necessarily so. According to the consent principle in PIPEDA, in order for consent to be meaningful the individual must also be made aware of and understand the purpose for which their information is collected. Consider providing a detailed description about your consent process

Use

- Under section 6, the third paragraph suggests that no personal information will be used by Concordia University, however addresses will be disclosed by CNE to Concordia and addresses are personal information.

Disclosure

- When information is required to be disclosed to the Cree Nation Government, is it personal information or personal health information? Consider whether disclosure can be limited.
- Please clarify the sentence in section 8 under *Cree Nation Government,* "[o]nly information relating to the addresses of NZE homes will be disclosed by the...and McGill University". Please specify what additional information, if any, is being referred to here. You could also use a definition, point to a table, etc. If only addresses of NZE homes will be shared, say that.

2. Information flow map that outlines each CUD of personal information or personal health information, with a corresponding legal authority for each flow	Yes	No	Partially
			✓

Comments:

This evaluation is completed with regard to Page 27 of the Smart Cities Challenge Finalist Guide.

- More clarity is needed on flow of specific information (for example, identify whether it's personal information or personal health information) between the parties. Consider making more references to the tables of types of data to be collected, used or disclosed, if it accurately represents the data flow.
- The PPIA stops short of discussing Concordia University or McGill University's policies in relation to the personal information or personal health information collected, used and disclosed as part of this project. Consider entering into contractual agreements with them with respect to their handling of personal information or personal health information associated with this project. In the alternative, CNE may wish to consider receiving assurances from the universities' that the personal information or personal health information will be handled according to applicable privacy legislation and their own privacy policies.
- In order for McGill to complete its qualitative study, is the collection of names and addresses of occupants of NZE homes necessary? Per the limiting collection principle in PIPEDA, personal information should only be collected if it is necessary. Consider whether McGill's qualitative study can be conducted without this personal information. If names and addresses are not collected, there may not be a need to anonymize the information before it is used for research and/or disclosed to third parties.
- Concordia University is expected to receive personal information identified in section 4 through "connective technologies." Consider specifying what this is. Per the safeguards principle in PIPEDA, consider whether there are adequate safeguards to protect the personal information or personal health information that will be transmitted via this method i.e. can it be encrypted, access provided to only those who need it, etc.
- Regarding legal authority for each flow: Concordia University and McGill University would be subject to privacy legislation in Quebec. Consider including a reference that indicates these two institutions are subject to applicable privacy law in Quebec.

3. Description of who you will collect personal information or personal health information from to enable the project with assessment of that person's authority to disclose the information	**Yes**	**No**	**Partially**
			✓

Comments:

- There is no description of how consent is obtained from the individual who provides his/her personal information or personal health information. There is only a statement indicating that CNE's Housing Department assumes consent is obtained when an individual directly provides their personal information or personal health information. Consider including a description of how consent is obtained from the individual. In addition, while the name and address of CNE members may be generally known given the size of Eastmain (reference to this made on Page 8 under consent), that does not constitute consent, nor mitigate the need to obtain consent, for the use of an individual's name and address.
- While it is clear that the purpose of collection was explained at public meetings during the design of the NZE program (this is in line with the PIPEDA principle of identifying purpose before or at the time of collection), consider including the purpose on the application form so that the applicant understands the purpose for why personal information is collected at the time of collection.
- With the statement in section 4, "[a]ll of the information...is obtained with the consent of the applicant", it appears some information about the individual will be obtained from third parties. If this is correct, what assurances do you have that the third party has the proper consent from the individual to disclose their personal information or personal health information to you? In addition,

This evaluation is completed with regard to Page 27 of the Smart Cities Challenge Finalist Guide.

identify who the third parties from whom the information is being obtained and specify what type of information it is (i.e. personal information or personal health information).			
4. Information governance plan	**Yes**	**No**	**Partially**
	✓		
Comments:			
• A plan is provided.			
5. Organizational privacy management framework, including related organizational access, correction, privacy and security policies	**Yes**	**No**	**Partially**
			✓
Comments:			
• PPIA generally discusses overall plan related to information, however, specificity is needed re: personal information and personal health information. • PPIA discusses steps in the event of a breach and corrective measures. • PPIA discusses need for improvement to technological controls and the need to set up a scheme for responding to access to information requests in accordance with PIPEDA principle of individual access. • PPIA discusses a grievance procedure in accordance with PIPEDA principle of challenging compliance. • Consider safeguards for connective technologies. • Consider training of individuals/employees re: collection, use and disclosure of personal information and personal health information. • Consider implementing a retention policy for the personal information and personal health information that is collected from CNE members; ensure Concordia and McGill's policies or agreements with CNE have same for the personal information or personal health information associated with this project.			
6. A plan that outlines the way in which you will consider privacy and security risks throughout the process including to complete a comprehensive PIA	**Yes**	**No**	**Partially**
	✓		

This evaluation is completed with regard to Page 27 of the Smart Cities Challenge Finalist Guide.

Comments:
• A general plan is provided. • Consider implementing a privacy policy. • No legend is provided for the numerical risk scale to describe what the values mean or how level of risk is evaluated. • PPIA states McGill will be anonymizing information prior to any reporting to prevent the risk of identifying individuals. How will McGill be anonymizing this information and how reliable is its process for doing so? Consider whether the information can be re-identified and how this risk can be mitigated.

This evaluation is completed with regard to Page 27 of the Smart Cities Challenge Finalist Guide.

Page(s) 426 to 433
are withheld
pursuant to paragraph
13(1)(e) 19(1) & 20(1)(b)
of the *Access to Information Act*

****

La/les page(s) 426 à 433
Font l'objet d'une exception totale
conformément aux dispositions de paragraphe
13(1)(e) 19(1) & 20(1)(b)
de la *loi sur l'accès à l'information*

Executive Summary

Background

A Privacy Impact Assessment (PIA) is a risk management tool used to identify the actual or potential effects that a proposed or existing information system, technology, program, process or other activity may have on an individual's privacy. The purpose of completing this PIA is to identify the potential privacy impact resulting from our proposed project and the appropriate mitigations strategies. This PIA will cover all the proposed activities under the SMART Cities project and will consider all data stored and accessed through the Open edX platform including; Data Storage, Data Access, Data Retention and Data Disposal.

When developing this PIA, the project team referred to international, federal and provincial regulations regarding privacy to inform this PIA report. Also, throughout this project, the project team will continue to assess the project's privacy risks and impact to determine if there is a need to update the privacy analysis and/or the PIA report. This ongoing assessment is an essential part of identifying and mitigating new issues and changes impacting privacy that may arise during the implementation phases.

Privacy and Consent

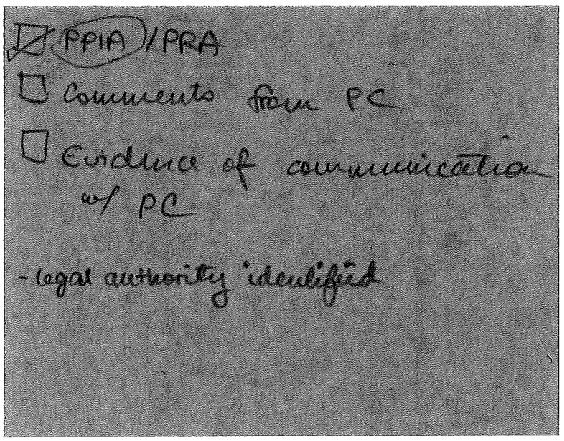
Enrolment in this program is 100% voluntary and students and their guardian will be required to provide consent prior to beginning the program. Once consent has been given the student will need to create an account on the Open edX platform, which will be how students can access the language and STEM training. Teachers will be the only other party that has access to this information, to ensure accurate grading. Community, industry partners and stakeholders will not collect, use or disclose any personal information.

Information flows

This project involves creating a blended-learning environment with both online and real-world components. To create the online learning environment the Open edX platform we'll collect minimal personal information to create an account (i.e. name, user name and password). Additionally, certain functionalities of the Open edX platform, such as the meetup forum or time spent watching videos, will also generate data on a user's location and behavior patterns.

The project team will work with Technology/Software providers, including Appsembler, our chosen SaaS (Software as a Service) provider of Open edX, to enter into a contractual agreement which will ensure personal information is handled in a privacy-compliant manner, and restricts the third party's use of personal information for purposes outside the project scope. In all cases the user will be advised about any third party's privacy policies/statements when directed to a third-party site for additional links or resources, as part of informed consent process.

Data stored on the Open edX platform will be removed from the server following a student's successful completion of the program.



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1.0 INTRODUCTION

Project Summary

Our Project Challenge Statement reads:

> *By means of active, cross-generational, technology-empowered, real-world participation in the intergenerational transfer of traditional Nishnaabe knowledge through the medium of our language, and the bilingual delivery of modern K-12 STEM knowledge, our community will transform our youth into better-educated, more-employable, better-grounded, and more holistically Nishnaabe people.*

The scope of our project includes the development of 2,000 hours of Nishnaabe-language immersion videos, the content of which will be our core aadsookaanan (our sacred stories, our philosophical foundations). It is intended that this will create understanders of our Nishnaabe language who can then go on to successfully complete an additional 1,000 hours of STEM educational video, the audio of which is delivered in our Nishnaabe language.

This project will move Nishnaabe people from being mainly passive consumers of technology to being active, effective STEM-educated administrators, managers, and users of data who are able to achieve meaningful outcomes for themselves, their families and their community. Upon completing high school, our youth will have received more than 2,000 hours of mobile-enabled, online Nishnaabe-language immersion instruction in all of our core aadsookaanan (sacred stories). Additionally, our youth will be able to comprehend spoken Nishnaabemwin and will have attained a basic proficiency in coding, robotics, and will possess a strong foundation in mathematics and science through an additional 1,000 hours of STEM curriculum. All STEM subject videos and courses will be available under a creative commons license, in both Nishnaabemwin and English. All of this education will occur in a blended-learning environment with a strong real-world participation component built into the program.

The eLearning functionality of our community's open source, mobile-enabled Learning Management System (LMS) - i.e., Open edX- facilitates the learning of the STEM subjects and the eAcquisition functionality of Open edX will facilitate the acquisition of our Nishnaabe language. The entire educational experience will be tied together with the meetup forum functionality of Open edX. This will serve as a bridge between the digital, online world and the material, real world. This forum will encourage and empower our youth to participate not only in online communities, but in the traditional Nishnaabe activities going on in the real-world community as well to add value to their overall learning experience. Based on this scope of work and objectives the following Project Management Plan has been developed to guide the project team through the implementation phases of this project and beyond.

Purpose of Privacy Impact Assessment Report

A Privacy Impact Assessment (PIA) is a risk management tool used to identify the actual or potential effects that a proposed or existing information system, technology, program, process or other activity may have on an individual's privacy. The purpose of completing this PIA is to identify the potential privacy impact resulting from our proposed project and the appropriate mitigations strategies. Notably, the PIA process is non-linear, as privacy concerns can and will continue to be identified over the course of the project's implementation. The appendices included with this report provide support to the process undertaken in completing the PIA.

Desired Response & Timelines

This PIA is being submitted to satisfy the requirements of the Smart Cities Finalist Challenge – Final Proposal. The project team is seeking prompt approval as required to proceed to the final proposal review stage.

Background

Scope of the PIA

Privacy is of the utmost importance to our leadership, project team and community as a whole. Much of the information we will be collecting for this project can be managed within the existing processes already managed by teaching staff (i.e. students names, grades, courses, contact information); however, given that this project entails a blended-learning environment, through the Open edX platform, this project will result in the generation of new data from users creating accounts on this platform. As such, this PIA will cover all proposed activities under the Smart Cities project, including all data stored and accessed through the Open edX platform. Considerations will also be made for Data Storage, Data Access, Data Retention and Data Disposal required throughout the lifespan of this project.

This PIA does not cover any existing processes in place to manage personal information already collected and managed within the community and school system that are not intertwined with the Open edX platform. For example, the Open edX platform does not provide the functionality to track course work completed only at the brick-and-mortar school, but only those K-12 curriculum augmentations that will be available on Open edX. As such, the only personal information that will be collected as part of this project will be generated from the user accounts, which will be accessible by the student and teacher only.

It should be noted that in addition to the information we collect via the Open edX platform, that as a 3rd party entity, users shall also be subject to the terms of this platform. Similarly, given that the Open edX platform links to 3rd party websites and embedded videos from 3rd party sites, users will similarly be subject to the privacy terms of these entities. As described within this preliminary PIA, the project team will work with Technology/Software providers, especially Appsembler, our chosen SaaS (Software as a Service) provider of Open edX, to enter into a contractual agreement which ensures all personal information is handled in a privacy-compliant manner, wherever possible. Particularly, the third party's use of the personal information will be restricted to only tasks they are contractually obligated to complete and nothing more. In all cases we will advise users about a third party's privacy policies/terms should the user be directed to a third-party site for additional links or resources, as part of informed consent process.

The process

The project team shall refer to international, federal and provincial regulations regarding privacy to inform this PIA report. Specifically, this included The *International Conference on Data Protection and Privacy Commissioners* resolution and the Canadian *Privacy Act* and the *Personal Information Protection and Electronic Documents Act (PIPEDA)*. Finally, provincial regulations and best practices have been used to inform our project team's understanding include the;

- Smart Cities Finalist Guide and Resources including staff

- Planning for Success: Privacy Impact Assessment Guide
- De-identification Guidelines for Structured Data

Also, throughout this project, the project team will continue to assess the project's privacy risks and impact to determine if there is a need to update the privacy analysis and/or the PIA report. This ongoing assessment is an essential part of identifying and mitigating new issues and changes impacting privacy that may arise during the implementation phases.

Glossary

Please refer to Appendix A for a glossary of terms.

PROJECT

Project Objectives:

Our project seeks to achieve the following four (4) objectives to meet our Challenge Statement. The progress indicators also outlined in **Table 1** will be used to measure the ongoing success of the project.

Table 1: Objectives and Measurable Outcomes:

Objectives		Progress Indicator/Measurable Outcome
1.	Youth who are "better-educated"	• Increase in number of K-12 STEM courses successfully completed by K-12 students, • Decrease in percentage of K-12 students needing remedial help in STEM subject areas
2.	Youth who are "more-employable"	• Increase in number of K-12 STEM courses successfully completed by K-12 students, • Increase in number of K-12 students who have at least a basic ability to code
3.	Youth who are "better-grounded" in their Nishnaabe identity	• Increase in number of K-12 students who know the key concepts expressed in each of our core aadsookaanan • Increased annual participation rate in number of traditional Nishnaabe activities for K-12 Students
4.	Youth who are "more holistically Nishnaabe"	• Minimum 2,000 hours of Nishnaabe language acquired by graduating eighth-graders • Increased annual participation rate in number of traditional Nishnaabe activities for K-12 Students • Minimum 1,000 hours of Nishnaabe-language STEM video successfully completed by graduating high school seniors

Description of Project

To achieve our project goals the creation of an online, mobile-enabled platform will be required that is able to carry out the following three functions:

(1) **eLearning.** Mobile-enabled eLearning functionality built into the Open edX platform. This refers to all learning online not related to language acquisition.
(2) **eAcquistion.** Mobile-enabled eAcquisition - the functionality will be nearly identical to our eLearning functionality, but will have the added responsibility of enabling the effective acquisition of our Nishnaabe language. Specifically, this include hosting and administrating 2,000 hours of Nishnaabe-language immersion videos. As our community makes a strong distinction between language *learning* (a conscious, cognitive process) and language *acquisition* (which occurs subconsciously), we need to keep these two functionalities independent of each other so that each one's unique pedagogical approach can be implemented effectively.
(3) **Meetup Forum.** Mobile-enabled meetup forum functionality will serve as the central 'online gathering' place which will facilitate the bridging and interfacing of the digital world with the material, real world.

We have chosen the Open edX platform for our project. Open edX is an open source software and facilitates the production of materials to be made available under a Creative Commons license. Appsembler is our chosen SaaS (Software as a Service) provider of the Open edX platform.

Accountability

The Smart Cities project team is accountable for this project. Please see roles and responsibilities for additional information.

Related Initiatives and Linkages

It is important for the project team to have a solid understanding of existing and ongoing initiatives in the community that may influence this Smart Cities project. The project team has identified three (3) existing projects of particular importance which should be monitored as part of the project management process. Project leads from each of the below initiatives have also already been identified as key stakeholders in the Smart Cities process and will continue to be consulted over the course of the project's implementation phases, as outlined in our stakeholder management plan.

- **Language Project:** ongoing project to capture and preserve the Nishnaabe language, specifically the Biigtigong dialect.
- **Curriculum Development:** ongoing project to update the school curriculum to emphasize cultural and land-based learning activities for K-8 students.
- **New School Project** Biigtigong Nishnaabeg is currently in the process of designing a new elementary school and Business Training and Education Complex. These facilities can be used to promote this program and facilitate participation by youth and young professionals. By having this easy access to the target audience this will ensure that the program is adopted.

PRIVACY

Participation and Consent

In order to ensure participants (and their legal guardians) make an informed decision when providing their consent to participate in the Open edX platform, a privacy seminar will be held at the community centre prior to program roll out. During this seminar, the project team will review the project and the content of this Privacy Impact Assessment to ensure participants (and their guardians) are knowledgeable of the inherent risks of participating in a partially-online learning platform. This seminar will overview what information will be collected and why, who will have access to this information once an account has been created and what agreements are in place (at that time) with all 3rd party providers. This seminar will also allow community members to voice their privacy concerns with respect to participating in an online environment. The project team will also present the policies and procedures developed thus far to mitigate any identified privacy risks and how any data breaches will be managed, as described within this document and further iterations of the PIA.

Should students, or their legal guardians, opt-out of the online-augmented (i.e., blended-learning) program, they will be given alternative means of participating in the K-12 curriculum at the brick-and-mortar school. It is important to note the participation in this Open edX platform is 100% voluntary and if not adopted will not diminish the learning of non-participants. Participants and their guardians will be provided a consent form outlining the privacy concerns and risks, for review and signature prior to enrolling in the Open edX platform.

Personal Information

Users of the Open edX platform will be required to provide the following types of personal information. This information will then be use by teaching Staff to offer better service to participants.

- Account creation and login information, including user name and password *
- Location information - anytime the student interacts with Open edX platform, location data is generated **
- Patterns of behaviour (which educational videos were watched and for how long)

*Students will not be asked to provide their address, date of birth nor other identifying information for the purposes of setting up an account with Open edX. The intent of collecting a user name and password is only to allow a student to create an account and login to the Open edX platform and to enable teachers to track a student's progress.

**Due to the very nature of the internet, anytime a person connects to the internet, the media that is being delivered to that person is trackable using a particular 'IP address.' Location data can then be deduced from that IP address. There is no reasonable (or perhaps possible) way to interact with the internet without generating location data. Total location privacy is not possible within the current organization of the internet since IP addressing is a foundational part of the internet. As such we can only attempt to maximize our privacy online - while accepting that our location will always be exposed to some degree.

The Open edX platform will be owned and operated by the Biigtigong Nishnaabeg Smart Cities project team, lead by Chief and Council. Students (via their guardians) will consent to voluntarily provide their name, user name, and password in order to create an account on the Open edX platform. Information to

be collected will include the name/user name of the student and the amount of time a student spends watching a video, as well as any participation in any traditional activities as tracked through the meetup forum functionality. Similarly, should students identify participation in traditional activities through the meetup forum functionality of Open edX, this will generate location data. Again, providing this information is voluntary and students will be given alternative means of participating and reporting involvement in real world opportunities outside of Open edX, if necessary.

The purpose of teachers collecting the aforementioned information is to ensure a student has completed the required curriculum. Teachers will not provide information about a student to Open edX nor to Appsembler. The flow of information is from student to Open edX to teacher, which is then provided back to the student in the form of a report card and to the project team in the form of aggregated summary data for performance measurement tracking only.

This student-specific information will only be accessible by the teaching staff. No other project team member will have access to individual student specific information. No information will be made public.

Legal Authority

The legal authority for this project rests with the regulations and polices of Biigtigong Nishnaabeg First Nation as well as FIPPA and related agreements with partners, agents and other third parties.

Roles & Responsibilities

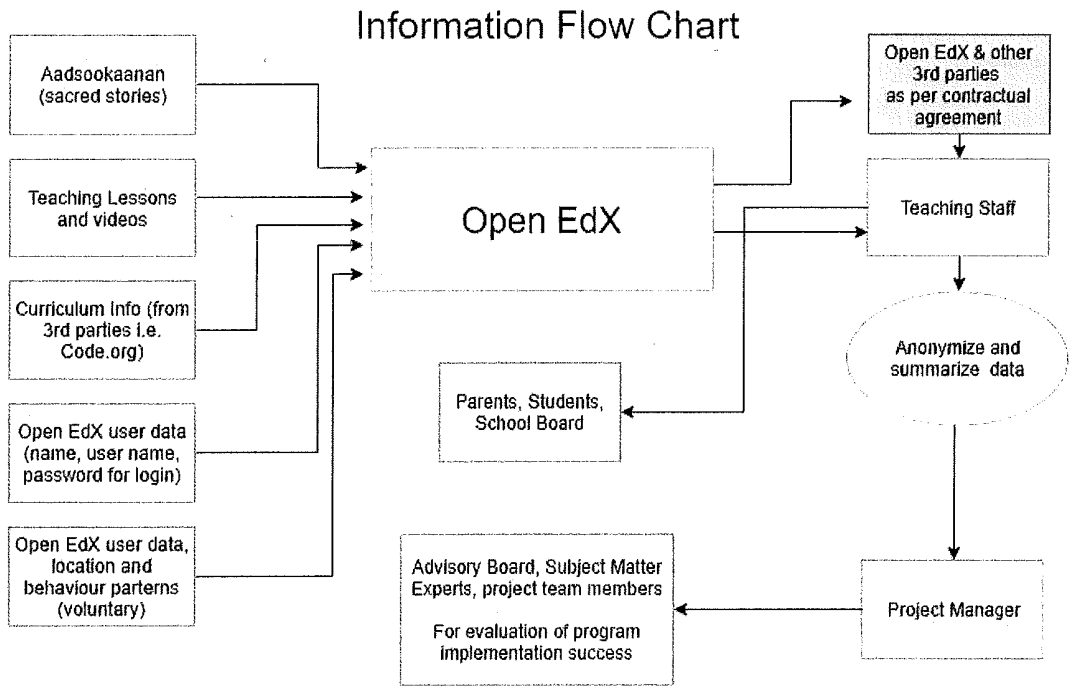
Role	Participant(s)	Responsibilities
Project Sponsor	Chief & Council	• Represent community • Provide project oversight and guidance as needed • Review/approve some project elements • Approve PIA
Subject Matter Experts	• Language consultant • Elders • Industry Partners • Teachers	• Provide language expertise data • Provide cultural expertise data • Provide Curriculum Expertise data (STEM) • Participate in PIA process (ongoing)
Advisory Committee	Community and Industry Leaders	• Approve major funding and resource allocation strategies • Authorize significant changes • Resolve conflicts and issues • Provide clear direction to the Project Manager • Review project deliverables and milestones • Identify risks and mitigation strategies • Participate in PIA process (ongoing)
Project Manager	Band Administration	• Manage project in accordance to the project plan • Coordinate with Advisory Committee • Supervise consultants and SMEs • Provide overall project direction • Direct/lead team members toward project objectives • Handle problem resolution • Manage the project budget • Participate in PIA process (ongoing)

Role	Participant(s)	Responsibilities
Project Participants, incl. technical staff and admin support	• Elders • Teachers • Language consultant • Video production team • Others to be identified by SC project Advisory committee	• Communicate project goals, status and progress to other participants, and project manager • Review and approve project deliverables and be held accountable for milestones • Create or help in creating work products (videos, written materials, curriculum). • Coordinate participation of individuals, teams and stakeholders • Evaluate outcomes and provide input on key performance indicators • Helps identify and mitigate project risks • Assure quality of products that will meet the project goals and objectives • Achieve milestones on time and on schedule • Participate in PIA process (ongoing)
Project Partners and Stakeholders	• Community • Industry • Technology/softw are providers	• Direct participation form community members who wish to provide opportunities traditional learning activities. • Indirect participation form industry and technology providers such as code.org, who we will engage for software and resources, but will have no direct involvement in the project. Community and industry partners and stakeholders will not collect, use or disclose any personal information. The project team will work with Technology/Software providers, including Open edX to enter into a contractual agreement which will ensure personal information is handled in a privacy-compliant manner, and restricts the third party's use of personal information for proposes outside the project scope. In all cases we will advise users about a third party's privacy policies/statements if the user is being directed to a third-party site for additional links or resources, as part of informed consent process.
Regulating Agencies	• Government of Canada • Government of Ontario	• Approval of PIA

BUSINESS PROCESSES AND INFORMATION FLOWS

The purpose of this section is to:

- Identify relevant businesses processes - both existing and planned - including changes to existing processes,
- Outline the key roles and responsibilities of the project team and the use of technology related to those business processes,
- Describe how personal information will flow through the business processes and technology,
- Describe how personal information will be collected, used, retained, disclosed, secured and disposed of, including changes to existing information flows, amounts or types of personal information involved and who will have access to the personal information and be responsible for it throughout its lifecycle



With respect to information flows, the following information will be provided to Open edX.

- Aadsookaanan
- Teaching Lessons and videos
- Curriculum
- Student name, user name, password (for access)
- Behaviour and location data (voluntary)

No additional information will be provided regarding the student's performance in other school programs. Again, this is a voluntary blended-learning environment (online and/or brick-and-mortar, but not online only) and therefore the intent is to not replace what is currently being done at the school level. All collection of student data will be limited to what is needed for educational purposes.

Teachers are the only project team members who can then access the student specific data. Behaviour data is required to make teachers being aware of how long a student struggled with a particular math problem, or how many times the student rewatched a video, and which sections of the video were rewatched, for example. This is one of the main benefits of using a blended-learning approach as this "behavioural pattern" data is what helps our teachers teach more effectively.

Teachers will then summarize the data and submit to the project team for performance monitoring and process improvements. Information collected by 3rd parties will be as per the contractual agreement. All terms of these agreements and risks to privacy resulting form 3rd party platforms and software will be communicated to users (and guardians) as part of the informed consent process.

PRIVACY ANALYSIS

The following table summarizes the results of our privacy analysis:

Process Statement	Process and Compliance measures
Purpose of the collection of personal information	This project involves creating a blended learning environment with both online and real-world components. The nature of an online learning environment results in the collection of minimal personal information to create an account, name, user name and password. Additionally, certain functionalities of the Open edX platform, such as the meetup application or time spent watching videos, will also generate data on a user's location and behavior patterns. Another source of data is the videos, stories, overdubbing etc. that will be created for the language immersion education and STEM bilingual courses portion of the project. This data will be stored on the Open edX platform as well as in a redundant hard-copy format (i.e., transcripts, tapes, etc.) to ensure data is not lost. There are no additional privacy concerns associated with storing physical copies of the educational materials. All information identified is absolutely necessary for participating in the project and/or for monitoring the success of the project
Source of personal information/ Accuracy	Data will be collected directly by users to generate their profile and then tracked using their Open edX account. For example, it will be necessary to track users time spent watching video to provide assurance that the student has completed the necessary videos for completing the curriculum requirements. Given that the curriculum will be developed in a blended learning environment (brick and mortar and online) this will only include the collection of data related to activities completed in the Open edX platform. Activities completed within the brick and mortar school will continue to be tracked by teaching staff under existing processes.

	Qualitative data will also be collected by teachers for users to inform feedback on the project, monitoring, evaluation and control purposes. Personal information will be collected directly from the Open edX platform. Collection of data from teaching staff will be required and is appropriate given the context of this project Given that information is provided directly by the user through the online platform, we do not anticipate any major inaccuracies. Likewise, the anonymized and summarized data to be provided by teaching staff is subject to their current process which ensure accuracy and privacy of student information.
Accountability and Openness	The project team is accountable for the data collection, management and safeguarding results from this project. The project team has intentionally minimized the amount of personal information to be collected through use of Open edX platform, as users will only need to provide their name, user name and password to create an account. Likewise, we will implement a process that enables students and their legal guardians to provide informed consent to participate in this voluntary process, thus ensuring they understand what information will be collected, why, and who will have access to it.
Manner of collection of personal information	The data to be collected is minimal and relatively not intrusive. It is similar (if not identical) to the information already being collected and managed by the school system. Similarly, the information collected via the Open edX platform is typical for any online platform. Use of the meet up application is voluntary, and any users will be provided a privacy statement to agree to prior to using this forum (i.e. authorizing sharing of user location data)
Limiting Use, disclosure and Retention	Teaching staff are already subject to policies and codes of conduct that govern how they treat personal information, through to physical or technical controls that protect the information. Safeguards that will be into place include physical security; IT security; staff training; policies, confidentiality clauses in contracts with external providers etc. Information, such as language videos, transcripts etc. are to be stored indefinitely as these are important records of our language and traditional teaching that we are attempting to preserve as part of this project. Personal information will only be used for the purpose it was collected for, and as described in this PIA. The personal information collected for the students will only be retained until graduation. Following successful graduation, all student data will be removed from the server and student accounts will be disabled. The collection, use, retention and disclosure of personal data, and particularly student data, should always be limited to what is necessary to fulfil authorized

	purposes. Reducing the risk posed by the excessive collection of student data is a core principle that guides this project's data processing practices.
Access and correction to personal information	Users will be able to access the account information on the Open edX platform. Information collected by teachers will be subject to the policies and procedures currently in place in the school system. Information will be shared with students and parents through existing channels (i.e. report cards). Access logs will be implanted to track access to personal information. Teachers can correct their existing report card writing process based on information collected. For example, should a student choose not to use the meet up forum, the teacher would not reflect the true involvement in traditional activities in that student's grade. Requests for personal information to be corrected will be handled on a case by case basis. However, we do not anticipate any major concerns with meeting this principle as all information collected is basic in nature and expect most changes, if any would be minor in nature such as their name, username or password changes.
Accuracy etc. of personal information	Given that information is provided directly and automatically by the user through the online platform, we do not anticipate any major inaccuracies. Likewise, the anonymized and summarized data to be provided by teaching staff is subject to their current process which ensure accuracy and privacy of student information. The process for anonymizing the data will involve the teaching staff providing the project team a summary report detailing quantitative data needed to provide details needed to track and report on performance indicators. This will include: • number of K-12 STEM courses successfully completed by K-12 students • number K-12 students needing remedial help in STEM subject areas • number of K-12 students who know the key concepts expressed in each of our core aadsookaanan • participation rate in number of traditional Nishnaabe activities for K-12 Students No personal or identifying information will be shared, nor will it be required, by the project team. The summarized data, omitting all personal information, is required by the project team to track, monitor and evaluate the implementation of the project, and to make course corrections when necessary. Qualitative data will also be collected for teachers to provide feedback on the project, for monitoring, evaluation and control purposes.
Data Disposal	Data stored on the Open edX platform will be expunged following a student's graduation.

Risk to Privacy Risk Strategy

Measures will be implemented to minimize risk as previously described. This includes policies for information flow, storage requirements, anonymized user names and a consent/privacy statement for users of Open edX as previously described.

Breach of Privacy Policy

The project team will develop and implement a breach response policy and protocol that addresses privacy and security risks for both the online and offline platform/storage methods.
Information custodians, namely Teaching staff, Chief and council, and the database administrator must immediately contact the to be named Privacy Officer, informing him or her of the following:

1. the nature of the breach;
2. the information that was exposed;
3. to whom it was exposed; and
4. for how long it was exposed.

The Information Custodian will work with the Privacy Officer who will advise whether notice to affected individuals and the Office of the Information and Privacy Commissioner of Ontario (IPC) is required. If such notice required, the Privacy Officer will work with the information custodian to meet the needs of the IPC.

Conclusions and next steps

The project team has completed the initial Preliminary PIA process. As the project is implemented the project team shall continue to:

- Refer to the International Conference on Data Protection and Privacy Commissioners resolution on eLearning Platforms in proceeding with our PIA
- monitor progress of privacy-related activities to make sure they are appropriately completed,
- assess any changes to the project's implementation, information flows, roles and responsibilities, to ensure that new privacy risks have not been created by these changes,
- evaluate mitigation measures to determine if they are effective when implemented; update or revise, if necessary,
- identify and assess new, outstanding and remaining privacy gaps and impact, and identify new action items required to address privacy risks,
    - alert the project lead and relevant decision-makers to any new privacy related problems, and obtain appropriate approvals to address or accept the privacy risks and
    - update or supplement the PIA documentation, as required, ensuring documentation of any newly identified privacy risks and impacts and how they arose, their likelihood, harm and priority for action and mitigation strategy to address the new privacy risks. The project lead and other appropriate decision-makers will approve all significant changes impacting privacy and the acceptance of any privacy risks.

AGORA

* Seems like the draft was completed, submitted to PC, feedback received but not incorporated, & draft submitted

Smart Cities Challenge

Personal Privacy Impact Assessment

March 5, 2019

Brazeau County // Lac Ste. Anne County // Parkland County // Yellowhead County

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ATIA - 19(1)

parkland county

Dear Infrastructure Canada,

We have created our first draft of the requested PIA and submitted it to the office of Leroy Brower, Assistant Information and Privacy Commissioner, at the Office of the Information and Privacy Commissioner of Alberta. Please find attached our PIA as well as the Commissioners feedback.

If awarded the Smart Cities Challenge prize we have already been in contact with Cenera (https://cenera.ca/) to discuss completing the final PIA using our first draft and the feedback from the Commissioner's office. We are cognizant that as the project develops there will be additional privacy developments that will need to be addressed. We are committed to working with our Provincial Privacy Commissioners office through every stage of the project to assure we are meeting all standards and expectations.

[redacted]

Barb Scully | Connected Communities Program Manager | Parkland County | 53109A HWY 779, Parkland County, Alberta T7Z 1R1
Office: 780-968-8888 ext. [redacted] Cell: [redacted]
[redacted]@parklandcounty.com | www.parklandcounty.com
One Parkland: Powerfully Connected.
See how you can grow your community:
https://youtu.be/JwFnVyMbQiw

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Office of the Information and
Privacy Commissioner of Alberta

February 15, 2019

RECEIVED
FEB 21 2019
Parkland

Ms. Barb Scully
Connected Communities Program Manager
Smart Parkland
53109A HWY 779
Parkland County, AB T7Z 1R1

Re: Parkland County Smart Cities Preliminary PIA

Dear Ms. Scully:

I am writing in response to your preliminary privacy impact assessment (PIA) on the Parkland County's Smart Cities project (the project), which our office received on February 5, 2018. Congratulations for being a finalist in this important competition.

We have completed our initial review of the preliminary PIA. Our comments focus on the Finalist Guide, Appendix 3 requirements, which are:

- Description of personal information or personal health information to the collected, used or disclosed (CUD);
- Information flow map that outlines each CUD of personal information or health information, with a corresponding legal authority table for each flow;
- Description of who you will collect personal information or health information from to enable the project with assessment of that person's authority to disclose the information;
- Information governance plan;
- Organizational privacy management framework, including related organizational access, correction, privacy and security policies; and
- A plan that outlines the way in which you will consider privacy and security risks throughout the process including to complete a comprehensive PIA.

Comments

- The PIA provides an information flow map, but no corresponding legal authority table for each flow was provided. Please provide a legal authority table.

- An organizational privacy management framework is required, but has not been provided. Please provide our office with an organizational privacy management framework, including related organizational access, correction, privacy and security policies. I've provided a link below to organizational privacy management framework guidance issued by our office.
  - https://www.oipc.ab.ca/media/383671/guide_getting_accountability_with_privacy_program_apr2012.pdf

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- The Finalist Guide requires a plan that outlines the way in which you will consider privacy and security risks throughout the project, including completing a comprehensive PIA. Please provide a plan that outlines the steps that will be taken as the project proceeds to ensure proper consideration of privacy risks, which eventually will conclude with completion and submission of a final PIA.

- Page 4 of the PIA references the City of Red Deer's Privacy Statement and Conditions of Use Policy and Strathcona County's Privacy and Security Statement. Please explain the reference and possible use of other municipality's policies.

- The list of personal information to be collected includes age, gender and marital status. A general statement is made that all information being collected is necessary to operate the open date portal and for research and development, but no further explanation is provided. Please clarify why each of these data elements must be collected in order to operate the program, and explain how collection is limited to only what is necessary in order to meet the purpose.

- Is the personal information to be collected linked or matched with any other information? If so, please outline this information and the steps taken to link and match it.

- There is indication in the PIA that data input is what "users opt to supply". Please elaborate on a user's ability to control what data they choose to make available. For example, can a user choose to not provide their marital status?

- Page 11 says that one of the projects mandates is to attract research and development. We note that the notice statement provided does not adequately inform a user that the information they provide will be used for this purpose. Please provide our office with a modified notice statement.

- Part 8 of the PIA addresses possible disclosures and says the information collected will only be disclosed for the purpose of research. We do not think this is accurate. For example, if Parkland County received a subpoena for information held within the portal, or received an access request for information held within the portal, it seems unlikely the information would not be processed and considered for disclosure. Please review the possible disclosures that may be necessary and revise this section, as well as consider necessary revisions to the notice statement.

- The information flow provided includes presenting a user with a research policy that they can agree to or not agree to. We are pleased to see user control included. However, we note that user control occurs after personal information has already been collected. Providing this notice and user control prior to collection would enhance privacy and reduce risk. Please provide rationale to support including user control at this stage of the information flow.

- As noted previously, a mandate of the project is research. The PIA indicates that research will comply with section 42 of the FOIP Act. Has the head of Parkland County approved conditions relating to security and confidentiality and the other factors listed in section 42(c)? If so, please provide them to our office.

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These are all of our questions or comments at this time. In summary, along with some areas of clarification, there are two key issues that we discovered in our review that we feel are important to address:

1. An organizational privacy management framework and related organizational policies is required, but has not been provided; and
2. It appears at this point that privacy and security assessment for the web-based tool/portal has not been completed and there is therefore no related privacy risk assessment and mitigating safeguards that have been outlined. This makes the plan that outlines the way in which you will consider privacy and security risks throughout the project, including completing a comprehensive PIA, a very critical component of our review, and ultimately, success in ensuring privacy issues are reasonably addressed. Please provide our office with a detailed plan that outlines the steps, and a timeframe for each step, in which privacy and security risks related to this project will be considered.

We request that you provide us with responses to our questions and comments on or before March 5th, and a copy of your final preliminary PIA that is submitted to Infrastructure Canada. Should your response identify a gap, please provide a plan that outlines how that gap will be addressed.

We will be providing Infrastructure Canada with comments based on the information you provide to us on or before March 5th.

We will complete a further comprehensive review of the final PIA should this project proceed.

Please contact Ms. Kreutzer-Work or me if you have any questions.

Sincerely,

[redacted]

LeRoy Brower
Assistant Commissioner

c: Ellen Sauve, Records Management Supervisor/FOIP Coordinator
Kim Kreutzer-Work, Director, Knowledge Management, OIPC

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SMART CITIES CHALLENGE, VIRTUAL AG LAB
Preliminary Privacy Impact Assessment (PPIA)

Submitted: February 5, 2019

Processed under the provisions of the Access to Information Act /Révisé en vertu de la Loi sur l'accés à l'information

Privacy Impact Assessment (PIA) Questionnaire to assess the protection of privacy in accordance with Part 2 of the *Freedom of Information and Protection of Privacy Act* (FOIP Act)
PIA: Smart Cities Challenge – Virtual Ag. Lab.

Part 1: Basic Information

1.1 Provide Program Area Identifiers.

Public Body	**Parkland County**
Division (if applicable)	**Strategic Initiative Division**
Dept. or Service Area	**Smart Parkland**
PIA Title	**Smart Cities Challenge - Virtual Ag Lab**
PIA File Number	**PIA 2019-01 SP**

1.2 Provide Program Area Contact Information.

This should be the name of the individual able to respond to questions regarding the PIA or the contact information of the position able to respond in future.

Name	Barb Scully		
Title	Connected Communities Program Manager		
Dept. or Service Area	Smart Parkland		
E-Mail	[redacted]@parklandcounty.com	Phone	780-968-8888 ext [redacted]

1.3 Description of the Initiative/Program/Application/System ("Initiative") under assessment:

In April 2018 Parkland County submitted an application for the Smart Cities Challenge in partnership with the other three municipalities. In June 2018 it was announced that our application had made the finalist round and the award was $250,000 to create a more comprehensive plan. The initial application was asked to provide a challenge statement for your community and ours is as follows:

"Our agricultural community will revitalize and grow through the connection of people to the land and food while attracting citizens to share in its prosperous, innovative and resilient way of life."

In fall 2018 five RFP's were created and sent by invitation to 3 vendors per RFP. The areas that are being looked for are in alignment with the response to Question 9 on the original application.

- **The design specifications of the AG Innovation Living Lab – We will work with external experts, and volunteer advisors to design the Living Lab and specify how it will be operated. Particular attention will be paid to specifying the Smart Community benefits that will be achieved by users of the Living Lab once it is functional. Program elements and technology support systems will be specified and, to some extent, prototype testing will be undertaken – both to determine what is feasible as well as to begin to build internal capacity to support the Living Lab into ongoing implementation. We will also conduct a research program to understand the emerging state of the art technologies that are available to support this concept. Anticipated budget $50,000**
- **A community developed Strategic Plan – We will engage Integral Strategy Network to deliver their proprietary collaborative Integral Strategy Roadmap process with us and our community stakeholders. This will deliver a complete action / implementation plan and will**

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create sustainable community capacity to carry this work forward into future years. Anticipated budget $100,000

- A series of 7 Smart Community events – We will plan and host 4 events to enhance community engagement efforts that we have accomplished to date. These will further spread the knowledge of what it means to be a Smart Community and further engage residents and businesses to continue to seek their input into the above noted Strategy and Living Lab specifications. It will continue to build widespread understanding of what will be possible as our Smart Community plans are implemented. Anticipated budget $40,000

- An infrastructure capacity / capability assessment – we will sub-contract external experts to undertake a complete review and gap assessment of the installed infrastructure in all participating Counties. This also will include a phased approach to resolve the gaps and make recommendations regarding core technology choices to deliver equitable internet/cellular access for all residents and businesses in the region. Anticipated budget $60,000

All of these activities will provide the background, community collaboration and plans necessary to develop our final proposal for submission for the overall Smart Community prize. We have a 1 in 5 chance of winning $10 million dollars to see the project through over 2-5 years.

The Strategic Plan was divided into two RFP's. A Sustainability Plan for the project and the coordinating and writing of the Final Application.

The awarding of the RFP's will create a team to coordinate, gather data, complete community and stakeholder engagement and build a final winning submission.

The submission is due March 5, 2019 and must include (as per the Infrastructure Canada Finalist Guide):

1.4 Purpose/Objective of the Initiative:

The goal of the Parkland County, Lac Ste. Anne, Yellowhead and Brazeau County initiative is based on our Challenge Statement:

"Our agricultural community will revitalize and grow through the connection of people to the land and food while attracting citizens to share in its prosperous, innovative and resilient way of life."

Our proposed initiative is a web based tool that houses a variety of applications under one umbrella to streamline the access to tools and services that deliver a solutions driven application. It will give assistance in the areas of succession planning, food security, rural safety, local economy and research and development to name a few. It will help forge connections locally for those involved in the agricultural sector as well as drive global connections to increase community economic development and innovation.

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Communities lead the way

The Smart Cities Challenge is a competition open to all municipalities, local or regional governments, and Indigenous communities (First Nations, Inuit, and Métis) across Canada.

This Challenge will empower communities across the country to address local issues their residents face through new partnerships, using a smart cities approach.

A smart cities approach means achieving meaningful outcomes for residents through the use of data and connected technology. This approach can be adopted by any community, big or small.

Finalists will receive support to develop their smart cities proposals. Winning communities will be awarded with prize money to help implement them.

Census websites included. Why?

Any attachment to the PIA should be included as Appendices. Please include a List of Appendices.

Appendices:

1. **Infrastructure Canada Original Proposal (Final application to be completed March 5th)**
2. **Hyperlink to City of Red Deer's Privacy Statement and Conditions of Use Policy and Strathcona County's Privacy and Security Statement**
3. **Information Sharing Agreement Templates**

Freedom of Information Protection of Privacy Act

1.5 Does the Initiative collect, use or disclose personal information as defined in section 1(n) of the FOIP Act[1]? **YES**

For example, are you implementing a collection of personal information that was not previously done? Are you changing the way you collect personal information in an existing Initiative in any way? Are you expanding the scope of the Initiative so more people may be affected? Are other agencies participating in the exchange of personal information under this Initiative? These are the types of questions to consider.

If the answer is YES, or if you are uncertain, continue this assessment.
If the answer is No, there is nothing further required; go to *Signatures* under Part 12 of this assessment.

1.6 List of personal information data elements being collected, used or disclosed under this Initiative.

The list of elements being collected, used or disclosed are:

-the individual's name, email, home or business address or home or business telephone number.

-the individual's age, gender, marital status or family status.

[1] Under section 1(n) of the FOIP Act, personal information is defined as "recorded information about an identifiable individual".

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-the individual's personal views or opinions.

The information collected will only be used to assist the Ag Lab to function as an open data portal for research and development. The collection of open data also supports the site in its goals to offer the best supports for users; residents, producers, nonprofits, value added agriculture sector, post-secondary and the research and development industry. Without the collection of information we are unable to collect enough data to understand user needs. A vital component of this project is to create a user driven virtual toolbox with a focus on the agriculture sector. In order to maintain the integrity if built, we must have the data and input that the users opt to supply. This information will help form the flow of information and services based on user needs and trends. The information and opportunity of open data will also drive solutions, innovation and educational opportunities for the users

1.7 Has any previous personal information privacy or security assessment been done for this Initiative or a related initiative?

Please list for cross-reference any related PIAs, Security Threat and Risk Assessments (STRAs) or other assessments previously completed or concurrently being undertaken.

Remember to include any attachments referenced in the PIA as Appendices.

NO

To date there have been no prior PIA's completed or performed on the potential Virtual Ag Lab.

Table of Legal Authority not included in flow chart

1.8 Provide a flowchart illustrating the information flows, i.e. the collection, storage movement, use and disclosure of all personal information.

This can be a block and arrow diagram. Make it as simple and as clear as possible.

The purpose of the flowchart is simply to identify where, how and to whom personal information is moving under this Initiative in order to aid identification of legislative authorities at each point of exchange.

Please include below or as an attachment. **Included with appendices**

Part 2: Collection (section 33)

Is this Initiative collecting personal information? **YES**

If the answer is YES, continue under this part of the assessment.
If the answer is No, go to *Use* under Part 5 of this assessment.

There are three authorities for a public body to collect personal information under the FOIP Act. Please think about all personal information data elements collected. The collection of some personal information data elements may have a different authority

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than other personal information data elements and we must identify every authority that applies. Check all that apply.

☐ The collection of the personal information is expressly authorized by an enactment of Alberta or Canada. [s. 33(a)] *If yes, provide the legislative authority: [Name and section of Act]*

☐ The collection of the personal information is for law enforcement. [s. 33(b)]

Note: law enforcement is defined under section 1(h) of the FOIP Act. In order to apply this authority, please review this definition and Bulletin No. 7: Law Enforcement found at: http://www.servicealberta.gov.ab.ca/foip/resources/bulletins.cfm

☒ The collection of the personal information is directly related to and necessary for an operating program or activity of the public body. [s. 33(c)]

Without the collection of the personal information; such as opinions, marital status and contact information, the Ag Lab cannot function as an open data portal for research and development. The collection of open data also supports the site in its goals to offer the best supports for users; residents, producers, nonprofits, value added agriculture sector, post-secondary and the research and development industry. Without the collection of information we are unable to collect enough data to understand user needs. A vital component of this project is to create a user driven virtual toolbox with a focus on the agriculture sector. In order to maintain the integrity if built, we must have the data and input that the users opt to supply. This information will help form the flow of information and services based on user needs and trends. The information and opportunity of open data will also drive solutions, innovation and educational opportunities for the users in areas such as collaborative projects with producers and post-secondary partners to work on real time solutions for the agriculture industry, matching research and development with value added agriculture businesses to create economic opportunity in the region and peer to peer mentorship leading to succession planning opportunities.

If you have checked any of these three authorities above for collection, you have identified an authority under the FOIP Act that allows the Initiative to collect the personal information. Please continue the assessment.
If the answer is No to all three of these authorities above, you have not identified an authority under the FOIP Act that allows the Initiative to collect the personal information. Is the Initiative collecting personal information? **Please contact your FOIP Coordinator for assistance (ext. 3229).**

Part 3: Direct/Indirect Collection (section 34)

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Personal information must be collected directly from the individual unless an exception to this requirement applies.

Is the Initiative only collecting personal information directly from the individual the information is about? **YES**

If the answer is Yes, go to *Notification* under Part 4 of this assessment.
If the answer is No and you are planning to collect any personal information indirectly, continue under this part of the assessment.

Please indicate whether any of the following statements are true. Please ensure indirect personal information flows are indicated on the preceding flowchart and be prepared to provide additional supporting information. Check all that apply.

☐ The individual authorized (consented to) another method of collection. [s.34(1)(a)(i)] *If yes, please explain how authorization is obtained:*

☐ Another Act or regulation authorizes the indirect collection. [s. 34(1)(a)(ii)] *If yes, provide the legislative authority: [Name and section of Act]*

☐ The Information and Privacy Commissioner has authorized the indirect collection. [s. 34(1)(a)(iii) with s. 53(1)(h)] *If yes, please provide any details in relation to the Commissioner's authorization such as expiry, conditions, etc:*

☐ The information is disclosed to the public body under the FOIP Act. [s. 34(1)(b)] *If yes, please provide the section of FOIP Act under which the personal information is disclosed to the public body:*

☐ The information is collected in a health or safety emergency and direct collection is not possible or is unsafe. [s. 34(1)(c)]

☐ The collection is from a designated emergency contact or contact for other specified circumstances. [s. 34(1)(d)]

☐ The indirect collection is for the purpose of determining suitability for an honor or award. [s. 34(1)(e)]

☐ The collection is from published or public sources for the purpose of fund raising. [s. 34(1)(f)]

☐ The indirect collection is for the purpose of law enforcement. [s. 34(1)(g)]

Note: law enforcement is defined under section 1(h) of the FOIP Act. In order to apply this authority, please review this definition and Bulletin No. 7: Law Enforcement found at: http://www.servicealberta.gov.ab.ca/foip/resources/bulletins.cfm

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☐ The indirect collection is for the purpose of collecting a debt or fine owed to the public body. [s. 34(1)(h)]

☐ The indirect collection concerns the history, release or supervision of an individual under the control or supervision of a correctional authority. [s. 34(1)(i)]

☐ The indirect collection is for use in the provision of legal services to the Government of Alberta or a public body. [s. 34(1)(j)]

☐ The indirect collection is necessary to determine eligibility for participation in a program or to receive a benefit, product or service from the public body and occurs in the course or processing an application. [s. 34(1)(k)(i)]

☐ The indirect collection is necessary to verify eligibility for participation in a program or current receipt of a benefit, product or service from the public body and the information was collected for that purpose. [s. 34(1)(k)(ii)]

☐ The indirect collection is for the purpose of informing the Public Trustee or a Public Guardian about clients or potential clients. [s. 34(1)(l)]

☐ The indirect collection is for the purpose of enforcing a maintenance order under the *Maintenance Enforcement Act*. [s. 34(1)(m)]

☐ The indirect collection is for the purpose of managing or administering personnel of the public body. [s. 34(1)(n)]

☐ The indirect collection is for the purpose of assisting in researching or validating the claims, disputes or grievances of aboriginal people. [s. 34(1)(o)]

If you have checked one of the preceding authorities for indirect collection, you have identified an authority under the FOIP Act to collect the personal information from another source rather than directly from the individual(s) themselves. **Notification is not required: skip to *Use* under Part 5 of this assessment.**
If none of these indirect collection authorities is selected, you must collect the personal information directly from the individual the information is about or identify options that meet one or more of these authorities. Please contact your FOIP Coordinator for assistance (ext. 3229)

Part 4: Notification (section 34)

*Notification is required when personal information is collected directly from an individual. This part of the assessment is completed when you are collecting information directly from individuals. Notification contains **three** elements:*

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i) Purpose of collection – This must be specific enough so a reasonable person can understand the purpose for which their personal information is collected including how it may be used and/or disclosed.

ii) Specific legal authority for collection – This should include any enabling legislation and/or the applicable FOIP Act authority.

iii) Job Title, business address and business telephone number of an officer or employee of the public body who can answer questions about the collection.

Does the notification provided to the individual at the time personal information is collected under this Initiative include the three elements listed above? [s. 34(2)] **Yes**

A disclaimer sentence below will be included at the time of collection and present at the beginning of any web area that is asking participants to opt in to information sharing.

not necessarily "research + development"

The personal information you provide will be used for the purpose of compiling and analyzing the data and linking the information to a geospatial map. This information is collected in accordance with Section 33 (c) of the Freedom of Information and Protection of Privacy (FOIP) Act. We collect only what is necessary for the operation of the open data portal. The information is used only for the purpose it was collected or for a consistent purpose. Further, we keep the information only for the length of time necessary to fulfill the purpose for which it was collected.
If you have any questions about the collection and use of this information, please contact the FOIP Coordinator at Parkland County, 53109A HWY 779, Parkland County, Alberta T7Z 1R1 (780-968-3229) or email foip@parklandcounty.com

NOTE: The current uses being examined are outlined in section 1.4 and section 2.0 of this document. Upon being awarded the Infrastructure Canada prize we would be first solidifying our plan of content and information flow. At that time a full privacy impact assessment will be completed to ensure it aligns with the FOIP Act. At the time of the creation of this assessment we have listed the current uses of information.

Part 5: Use (section 39)

Is the Initiative using personal information? **YES**

If the answer is YES, continue under this part of the assessment.
If the answer is No, go to *Disclosure* beginning at Part 6 of this assessment.

There are three use authorities for personal information under the FOIP Act. Please think about all personal information data elements involved; the use of some personal

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information data elements may have a different authority than other personal information data elements. Check all that apply.

☒ The personal information is being used under this Initiative according to the original purpose for which it was collected or compiled or for a use that is consistent with that original purpose of collection. [s. 39(1)(a)]

If the above is selected and the use includes consistent purposes, please confirm the consistent use meets both of the following:

☒ The consistent use has a reasonable and direct connection to the purpose for which the personal information was originally collected or compiled.

AND

☒ The consistent use is necessary for performing the statutory duties of or operating a legally authorized program of the public body using the personal information.

Provide details/explanation: **As stated in the description of the project the collection of personal information from our residents will support our goals in creating a user driven platform to provide the best information, resources and opportunities to the agricultural users.**

☒ The individual has identified the information and consented to the use. [s. 39(1)(b)]

We will create a privacy statement and conditions of use policy for the open data portal. See Appendices for examples.

☒ The use is for a purpose for which the information was disclosed to the public body under section 40, 42 or 43 of the FOIP Act. [s. 39(1)(c)]

If the above is selected and another public body is disclosing personal information to this Initiative under a FOIP Act disclosure authority (sections 40, 42 or 43), this is the corresponding authority for the Initiative's use of the information.

If this Initiative receives and uses personal information disclosed from another public body and you are uncertain it is being disclosed under the FOIP Act, you may wish to return to this question after reviewing the authorities in ***Disclosure*** *beginning at Part 6 of this assessment and in consultation with the other public body.*

If you have checked one of the preceding authorities for use, you have identified an authority under the FOIP Act that allows the Initiative to use the personal information. Please continue the assessment.
If none of these use authorities is selected, you have not identified an authority under the FOIP Act that allows the Initiative to use the personal information. **Please contact your FOIP Coordinator for assistance (ext. 3229).**

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Part 6: Disclosure for Research or Statistical Purposes (section 42)

Has a researcher requested records that contain personal information as part of this initiative? **YES**

If the answer is YES, then all the conditions under section 42 of the FOIP Act must be met including signing an agreement to comply with the approved conditions. **Please contact your FOIP Coordinator for assistance (ext. 3229).**
If the answer is YES, and this is the only disclosure, go to *Accuracy and Retention* under Part 9 of this assessment.
If the answer is YES, and there may be additional disclosure authorities, or if the answer is NO, go to *Disclosure of Information in Archives* under Part 7 of this assessment.

One of the projects mandates is to attract research and development both to the virtual space as well as the physical region. Upon the development of the project, if awarded, disclosure and permissions policies will be formed in compliance with the FOIP act and under the direction of the FOIP Coordinator. It will be created to meet all conditions under section 42 of the FOIP act. Any information collected will be on an "opt in" bases from participants and we will collect only the minimal information needed to achieve our purpose.

Part 7: Disclosure of Information in Archives (section 43)

The Provincial Archives of Alberta and the archives of a public body may disclose information as authorized by section 43 of the FOIP Act.

Is the disclosure of personal or other information held in an archives part of this Initiative? **NO**

If the answer is YES, continue under this part of the assessment.
If the answer is NO, go to *Disclosure of Personal Information* under Part 8 of this assessment.

☐ Has the record been in existence for 25 years or more and the disclosure would not be an unreasonable invasion of privacy under section 17 of the FOIP Act? [s. 43(1)(a)(i)(A) with s. 17]

☐ Has the record been in existence for 25 years or more and the disclosure is for research or statistical purposes in accordance with section 42 of the FOIP Act? [s. 43(1)(a)(i)(B) with s. 42]

☐ Has the record been inexistence for 75 years or more? [s. 43(1)(a)(ii)]

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☐ Has the record been in existence for 25 years or more and the disclosure would not be harmful to the business interests of a third party under section 16 of the FOIP Act? [s. 43(1)(b)(i) with s. 16]

☐ Has the record been in existence for 25 years or more and the disclosure would not be harmful to a law enforcement matter within the meaning of section 20 of the FOIP Act? [s. 43(1)(b)(ii) with s. 20]

☐ Has the record been in existence for 25 years or more and the information is not subject to any type of legal privilege under section 27 of the FOIP Act? [s. 43(1)(b)(iii) with s. 27]

If you have checked one or more of these authorities for Disclosure of Information in Archives and this is the only disclosure is archival, go to *Accuracy and Retention* under Part 9 of this assessment.
If there are other disclosures, or if no authorities listed above apply, go to *Disclosure of Personal Information* under Part 8 of this assessment.

Part 8: Disclosure of Personal Information (section 40)

Is the Initiative disclosing personal information? **YES**

Personal information will be disclosed only for the purpose of research under section 42 and would include an information sharing agreement where applicable.
See appendices for template. All activity will align and meet the requirements of section 40 of the FOIP act.

If the answer is YES, continue under this part of the assessment.
If the answer is NO, go to *Accuracy and Retention* under Part 9 of this assessment.

There are many authorities that allow for a public body to disclose personal information under the FOIP Act. Please think about all personal information data elements disclosed and all instances of disclosure; the disclosure of some personal information data elements may have a different authority than other personal information data elements. Additionally, a disclosure to one public body or organization may have a different authority than a disclosure to another one.

Section 40(4) requires that a public body may disclose personal information only to the extent necessary to enable the public body to the carry out the purposes (described in the disclosure provisions that follow) in a reasonable manner.

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Check only those types of disclosure that are specifically intended to occur under the Initiative under assessment.

☒ The disclosure is in accordance with a FOIP Act access request. [s. 40(1)(a)]

☒ The disclosure is not an unreasonable invasion of a third party's privacy under s. 17. [s. 40(1)(b) with s. 17]

Note: Section 17(2) lists when a disclosure is not an unreasonable invasion of privacy under formal access. If disclosure under this Initiative is listed in section 17(2), then this disclosure provision may apply.

☒ The personal information is being disclosed under this Initiative according to the original purpose for which it was collected or compiled or for a use that is consistent with that original purpose of collection. [s. 40(1)(c)]

If the above is selected and the use includes consistent purposes, please confirm the consistent use meets both of the following:

☒ The consistent use has a reasonable and direct connection to the purpose for which the personal information was originally collected or compiled.

AND

☒ The consistent use is necessary for performing the statutory duties of or operating a legally authorized program of the public body using the personal information.

Provide details/explanation: **The initiative is undertaken by the municipalities to serve our residents. Municipalities operate under the MGA and FOIP**

☒ The individual has identified the information and consented to the disclosure in the prescribed manner. [s. 40(1)(d)]

We will create a privacy statement and conditions of use policy for the open data portal including an opt-out option for certain personal contact information. See Appendices for examples

☐ The disclosure is done in order to comply with an enactment of Alberta or Canada, or with a treaty, arrangement or agreement made under an enactment of Alberta or Canada. [s. 40(1)(e)]

☐ The disclosure is for any purpose where an enactment of Alberta or Canada authorizes or requires the disclosure. [s. 40(1)(f)]

☐ The disclosure is to comply with a subpoena, warrant or order made by a court, person or body having jurisdiction in Alberta to compel the production of information or with a rule of court binding in Alberta that relates to the production of information. [s. 40(1)(g)]

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☐ The disclosure is to an officer or employee of the public body or to a member of the Executive Council, and is necessary for the performance of the duties of that officer, employee or member. [s. 40(1)(h)]

☐ The disclosure is to an officer or employee of a public body or to a member of Executive Council, if the disclosure is necessary for the delivery of a common or integrated program or service and the performance of the duties of the officer or employee or member to whom the information is disclosed. [s. 40(1)(i)]

☐ The disclosure is for the purpose of enforcing a legal right that the Government of Alberta or a public body has against any person. [s. 40(1)(j)]

☐ The disclosure is for the purpose of:

i) Collecting a fine or debt owing by an individual to the Government of Alberta or to a public body, or to an assignee of either of them, [s. 40(1)(k)(i)] or

ii) Making a payment owing by the Government of Alberta or a public body to an individual. [s. 40(1)(k)(ii)]

☐ The disclosure is for the purpose of determining or verifying an individual's suitability or eligibility for a program or benefit. [s. 40(1)(l)]

☐ The disclosure is to the Auditor General or any other prescribed person or body for audit purposes. [s. 40(1)(m)]

☐ The disclosure is to a member of the Legislative Assembly who has been requested by the individual the information is about to assist is resolving a problem. [s. 40(1)(n)]

☐ The disclosure is to a representative of a bargaining agent who has been authorized in writing by the employee the information is about to make an inquiry. [s. 40(1)(o)]

☐ The disclosure is to the Provincial Archives of Alberta or to the archives of a public body for permanent preservation. [s. 40(1)(p)]

☐ The disclosure is to a public body or a law enforcement agency in Canada to assist in an investigation:

i) Undertaken with a view to a law enforcement proceeding, [s. 40(1)(q)(i)] or

ii) From which a law enforcement proceeding is likely to result. [s. 40(1)(q)(ii)]

☐ The disclosure is from a law enforcement agency and the information is disclosed:

i) To another law enforcement agency in Canada, [s. 40(1)(r)(i)] or

ii) To a law enforcement agency in another country under an arrangement, written agreement, treaty or legislative authority. [s. 40(1)(r)(ii)]

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Note: law enforcement is defined under section 1(h) of the FOIP Act. In order to apply this authority, please review this definition and Bulletin No. 7: Law Enforcement found at: http://www.servicealberta.gov.ab.ca/foip/resources/bulletins.cfm

☐ The disclosure is so that the spouse or adult interdependent partner, relative or friend of an injured, ill or deceased individual may be contacted. [s. 40(1)(s)]

☒ The disclosure is in accordance with s. 42 (Disclosure for Research or Statistical Purposes) or 43 (Disclosure of Information in Archives). [s. 40(1)(t) with s. 42 or s. 43]

*If **YES**, see also **Disclosure for Research or Statistical Purposes** and/or **Disclosure of Information in Archives** under Parts 6 and 7 of this assessment.*

☐ The disclosure is to an expert for the purposes of s. 18(2). [s. 40(1)(u) with s. 18(2)]

Section 18(2) applies under formal access when disclosure may be harmful to individual or public safety and the personal information of the applicant must be disclosed to an expert in order for their assessment to determine if section 18 applies.

☐ The disclosure is for use in a proceeding before a court or quasi-judicial body to which the Government of Alberta or a public body is a party. [s. 40(1)(v)]

☐ The disclosure is by the Minister of Justice and Solicitor General or an agent or lawyer of the Minister of Justice and Solicitor General to a place of lawful detention. [s. 40(1)(w)]

☐ The disclosure is for the purpose of managing or administering personnel of the Government of Alberta or the public body. [s. 40(1)(x)]

☐ The disclosure is to the Director or Maintenance Enforcement for the purpose of enforcing a maintenance order under the *Maintenance Enforcement Act*. [s. 40(1)(y)]

☐ The disclosure is to an officer of the Legislature, if the information is necessary for the performance of the duties of that officer. [s. 40(1)(z)]

☐ The disclosure is for the purpose of supervising an individual under the control or supervision of a correctional authority. [s. 40(1)(aa)]

☐ The Initiative is disclosing personal information that is available to the public. [s. 40(1)(bb)]

☐ The Initiative is disclosing personal information that is routinely disclosed in a business or professional context, i.e. limited to an individual's name and business contact information, including business title, address, telephone number, facsimile number and e-mail address and does not reveal other personal information about the individual or personal information about another individual. [s. 40(1)(bb.1)]

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☐ The disclosure is to the surviving spouse or adult interdependent partner of a relative of a deceased individual if, in the opinion of the head of the public body, the disclosure is not an unreasonable invasion of the deceased's personal privacy. [s. 40(1)(cc)]

☐ The disclosure is to a lawyer or student-at-law acting for an inmate under the control or supervision of a correctional authority. [s. 40(1)(dd)]

☐ The head of the public body believed, on reasonable grounds, that the disclosure will avert or minimize a risk of harm to the health or safety of a minor. [s. 40(1)(ee)(i)]

☐ The head of the public body believed, on reasonable grounds, that the disclosure will avert or minimize an imminent danger to the health or safety of any person. [s. 40(1)(ee)(ii)]

☐ The disclosure is to the Administrator of the *Motor Vehicle Accident Claims Act* or to an agent or lawyer of the Administrator for the purpose of dealing with claims under that Act. [s. 40(1)(ff)]

☐ The disclosure is to a law enforcement agency, an organization providing services to a minor, another public body or any prescribed person or body if the information is in respect of a minor or a parent or guardian of a minor and the head of the public body believes, on reasonable grounds, that the disclosure is in the best interests of that minor. [s. 40(1)(gg)]

Additional provisions related to post-secondary educational bodies are in place. If this PIA is being completed by a post-secondary institute, please check with your FOP Office.

If you checked at least one of the preceding authorities for disclosure, you have identified an authority under the FOIP Act that allows the Initiative to disclose the personal information. Please continue the assessment.
If the answer is No to all of these disclosure authorities above, you have not identified an authority under the FOIP Act that allows the Initiative to disclose the personal information. Please contact your FOIP Coordinator for assistance (ext. 3229).

Part 9: Accuracy and Retention (section 35)

If an individual's personal information is used by a public body to make a decision that directly affects the individual, the public body must make every reasonable effort to ensure that the information is accurate and complete.

An individual has a right to access their personal information for a period of one year after it is used to make a decision that directly affects them. A shorter retention

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period may be agreed upon by the individual, the public body and any other body that approves retention schedules. Or there may be longer retention periods required due to business and legal requirements.

It is important that you ensure an appropriate records retention and disposition schedule is applied. Alberta government records cannot be destroyed or archived without a records retention and disposition schedule in place. This increases risk in storing records longer than may be required and potentially increases the volume of responsive records under a formal access request.

Do you have an approved records retention and disposition schedule for the records subject to this initiative? [s. 35(a)] *If yes, please provide the records retention and disposition schedule number or name: you may contact Information Management Services for assistance in determining retention. Ext. 8308 or 3229)*

1. ***STRATEGIC MANAGEMENT – GRANTS AND SPONSORSHIPS ~ Grant Applications* (by County): Smart Cities Challenge – Virtual Agriculture Lab**

   Records relating to the County's application, approval and assignment of grant program applications either accepted, rejected or refused (successful or unsuccessful) by outside organizations such as Federal or Provincial Governments.

   Note: Grants are regulated under Alberta Regulations 123/2000 Municipal Affairs Grants

   CLOSURE CRITERIA and RETENTION:

   After application approved or rejected, retain for 11 years and destroy (this is based on the Limitations Act)

2. **INFORMATION MANAGEMENT – AGREEMENTS -**

   Confidentiality agreements and related records between the County and external bodies (e.g. data matching and data linking) dealing with issues such as use of data and/or information.

   Also includes records relating to research and/or statistical agreements.

   Note: Section 42 of the FOIP Act says the County may disclose personal information for research purposes only if an agreement to comply with all approved conditions, the Act, and any applicable policies/procedures are signed by the person to whom the information is disclosed.

   Section 9 of the FOIP Regulation sets out the conditions for an Agreement for Disclosure.

   MRD - Legislative and Administrative Services Departments

   CLOSURE CRITERIA - Destroy 11 years after all conditions relating to the agreement have been satisfied fully

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If the answer is No, or if you are uncertain, please contact the individual(s) responsible for records management in your public body.
This is not a PIA requirement but another business consideration.

Are there procedures in place to enable an individual to request/review a copy of their own personal information? [s. 35(b)]

If the answer is No, or if you are uncertain, please contact your FOIP Coordinator for assistance (ext. 3229).

Part 10: Correction of Personal Information (section 36)

If an individual believes there is an error or omission in their personal information, they have the right to request correction.

The public body must not correct an opinion such as professional or expert opinions.

Annotation or Linking: if the correction is not made or cannot be made, the request for correction must be annotated or linked to the record.

*Note: **Annotate** means written on a record close to the information. **Link** means attach to, join or connect to the original record.*

Check all that apply.

☐ There are procedures in place to correct, annotate or link an individual's personal information if requested, including what source was used to update the file. [ss. 36(1), (2), (3) and (6)]

☐ If personal information is corrected, are there procedures in place to notify other holders of this information in accordance with the FOIP Act? [ss. 36(4) and (5)]

☐ Are there procedures in place to give written notice to the individual when a correction, annotation or linkage has been made to an individual's personal information? [s. 36(6)]

☐ Are there procedures in place to transfer a request for correction to another public body and notify the individual of the transfer? [s. 15]

If you have not checked all boxes in *Correction of Personal Information* under Part 10 of this assessment as *No*, please contact your FOIP Coordinator for assistance (ext. 3229).

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Part 11: Security and Storage for the Protection of Personal Information (section 38)

A public body is required to protect personal information in its custody or under its control by making reasonable security arrangements against such risks as unauthorized access, collection, use, disclosure or destruction. This PIA Questionnaire is not a security assessment, nor a threat and risk assessment.

Please complete this part of the assessment with the understanding that ideally this section should be completed in collaboration with the information security office of your public body, or individuals responsible for information security, who can advise in relation to risk and vulnerability. The head of the public body, or their delegate, is responsible to ensure personal information is protected under the FOIP Act.

The "Business Owner" or "Custodian" with day-to-day responsibility for the information is accountable for any risk to the security of the confidential and personal information captured under this Initiative or under the scope of this PIA. This accountability to the head of a public body, or their delegate, must be considered and understood on the part of the program area and signatories signing off on this PIA.

If your public body does not have an information security policy, it is a good idea to develop one based on current industry standards, with consideration to the type and sensitivity of the information in your public body's custody and control. Sometimes these security measures may be simple physical ones (such as locking a cabinet) or administrative (such as training) or technical. For further direction, please refer to the list of security resources attached, in consultation with your public body's information security or information technology resources.

Does this Initiative comply with your public body's information security management policies, rules and procedures? [s.38]

No – Parkland County does not have a security policy in place but one will be created for the purpose of this project. Our preliminary plans have the project being all virtual and existing on a cloud based platform. We are working with multiple vendors on the planning stage. All have security policies. When we do the final plans for the project we will be working with the vendors and creating a policy that fits all the government requirements as well technical obligations for our users.

If the answer is YES, please continue with the assessment.
If the answer is NO, you have not satisfied the security requirement of this PIA. Please contact the Information Technology Supervisor for assistance (ext. 8414).

How is the information involved in this Initiative classified for security purposes?

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Your public body may have its own information security classification and if it does, you should apply that classification. If not, you may wish to adapt the Government of Alberta classification system to the types of information in your public body:

http://imtdocs.alberta.ca/Information_Security_Classification.pdf

Please provide or describe the information classification. If you have any questions regarding the classification please contact your records management or information security office.

Provide Department/Service Area Security Contact Information.

This should be the name of the individual able to respond to questions about meeting reasonable security measures under this Initiative.

Name	Barb Scully		
Title	Connected Communities Program Manager		
Dept. or Service Area	Smart Cities		
E-Mail	[redacted]@parklandcounty.com	Phone	780-968-8888 ex[redacted]

Additional Comments:

Part 12: Signatures

Suggested Signatures with Signatories names printed and date of signature.

Signature: _____ Signatory Name: _____	Date: _____
Service Area/Department – responsible to provide information in this PIA related to the Initiative that is complete and accurate.	
Signature: _____ Signatory Name: _____	Date: _____
FOIP Coordinator – provides support in understanding the PIA Questionnaire and meeting FOIP Act requirements.	
Signature: _____ Signatory Name: _____	Date: _____

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Information Services Manager - provides support in understanding compliance with Parkland County's security directives.	
Signature: _____ Signatory Name: _____	Date: _____
Immediate Supervisor of the owner of the PIA – someone with accountability for the department/service area or records of the project initiative	

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APPENDICES:

1. Preliminary PIA Flow Chart.

2. Proposal – Access Personal Information for Research or Statistical Purposes form

3. Agreement - Access to Personal Information for Research or Statistical Purposes

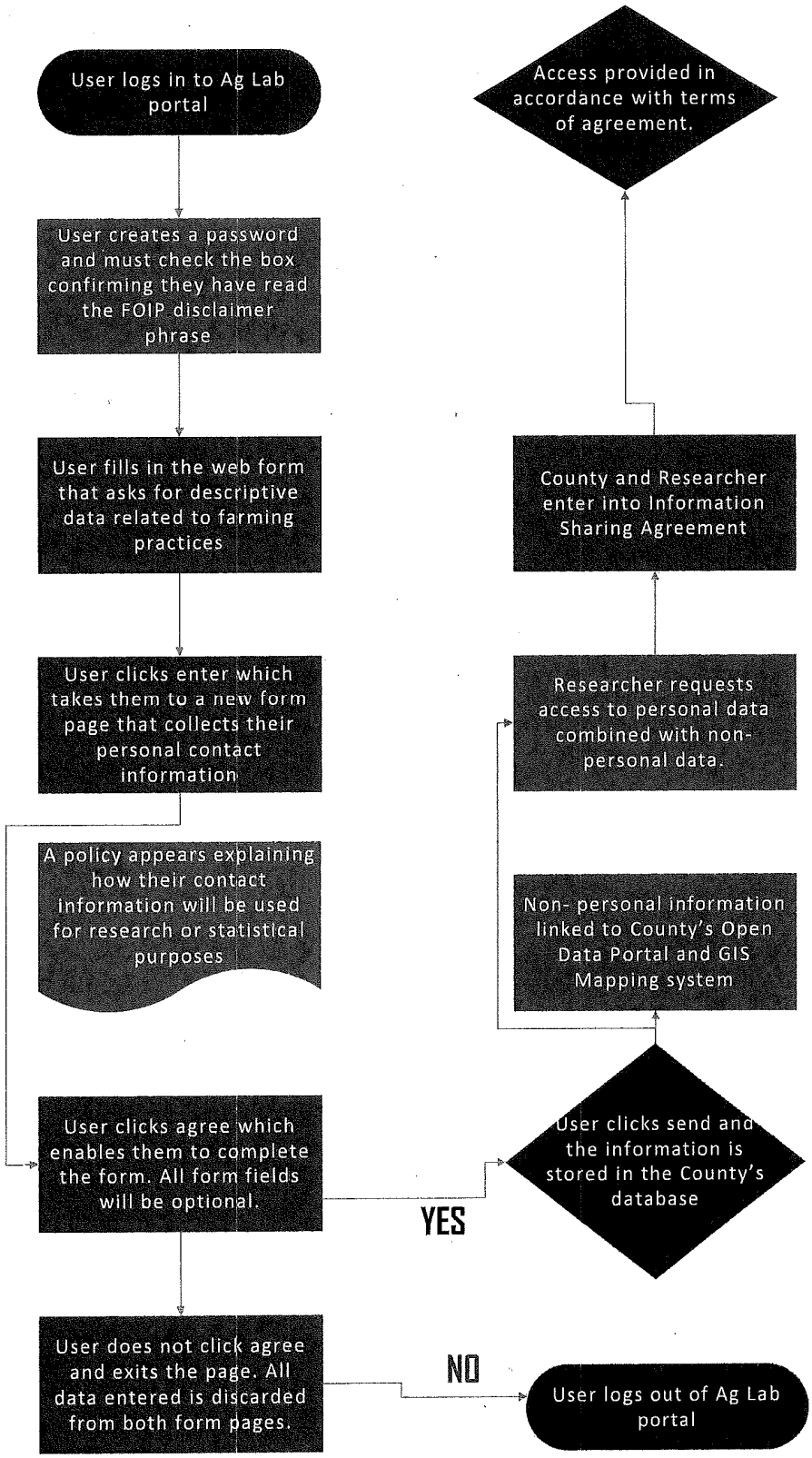
4. Samples of web page privacy and security statements which Parkland County will customize and link to the Ag Lab data collection site:
   https://www.strathcona.ca/privacy-and-security-statement/
   http://www.reddeer.ca/conditions-of-use-privacy-and-copyright/conditions-of-use/

5. Information Sharing, when required for research or statistical purposes will follow the recommended guide below offered through Service Alberta's FOIP Website.
   https://www.servicealberta.ca/foip/documents/PerInfoSharingAgreements.pdf

6. Smart Cities Challenge Application Submission to Infrastructure Canada
   https://www.parklandcounty.com/en/do-business/resources/SmartParkland/MP-Smart-Cities-May-4.pdf

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Personal Information Collection, Use and Disclosure



foip | Freedom of Information and Protection of Privacy Act

_____
Name of Public Body

Proposal
to
Access Personal Information
for
Research or Statistical Purposes

This form is used to request access, for research or statistical purposes, to personal information contained in records covered by the *Freedom of Information and Protection of Privacy Act* (the *FOIP Act).* If this request is approved by _____,
Name of Public Body
you will be asked, prior to being provided access to records containing personal information, to sign a research agreement that ensures that individuals' privacy will be protected when their personal information is in your custody.

The collection of the information on this form is authorized by the *Act* and will be used only to evaluate and administer the request for access to personal information for the purpose of research.

The following person can answer any questions concerning this proposal or the collection of the information on this form.

Name of Contact: _____

Title: _____

Name of Public Body: _____

Business Address _____

Business Telephone Number: ( ) _____

Completeness and clarity will assist the

_____
Name of Public Body
to assess this proposal quickly.

NOTE: ***A fee may be charged to provide this information. An estimate of the fee will be provided in advance.***

SA 114 (2009/05)

Proposal to Access Personal Information for Research or Statistical Purposes

Identification of Researcher

Name *(Last, First, Initials)*				
Mailing Address *Street*		*City/Town/Village*	*Province*	*Postal Code*
Telephone Number ( )		Fax Number ( )		
E-mail Address				

Provide the following additional information, if applicable:

Institutional, Society or Corporate Affiliation *(include department if relevant)*
Position
Provide the name of your Academic Advisor if you are a student

Provide a curriculum vitae including the following information: education, research experience, and knowledge of subject.

Description of Research Project

Attach the following information:

1. A general description of the research project *(include the objectives of the project and the proposed method(s) of analysis).*
2. An explanation of why the research project cannot be accomplished without access to personal information about named or identifiable individuals.
3. A detailed explanation of how the personal information will be used, including a description of any proposed linkages to be made between personal information in the records requested and any other personal information.
4. The expected period of time during which access to these records may be required.
5. The expected period of time during which these records will be used.
6. The benefits to be derived from the research project.
7. Describe the security measures you propose to put in place. The security and confidentiality of the personal information that will be in your custody must be protected and unauthorized disclosure must not occur.

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Funding

Has funding to complete the project already been approved or received? ☐ Yes ☐ No

If funding is not already in place, explain the conditions and circumstances that will allow the project to be completed.

Additional Information

Please add any other information that you believe will assist

_____ in assessing this application.

Name of Public Body

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Records Requested

Describe all records containing personal information to which access is requested. Provide as much detail as possible. Access will be given only to records listed below and only for the purposes approved for the research project described on Page 2 of this form. Any changes or additions to this list after the application is submitted should be made in writing and will require approval in writing from

Name of Public Body

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Records Requested - Continued

Originals may be viewed only at

_____
Name of Public Body

Will you require the above records to be copied (at your expense) for viewing elsewhere? ☐ Yes ☐ No

FOR PUBLIC BODY USE ONLY

The application for records pursuant to Section 42 or Section 43 of the Act is approved subject to the terms and conditions of a corresponding research agreement.

_____
Signature of Authorized Official

_____
Position

_____
Date

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foip | Freedom of Information and Protection of Privacy Act

Name of Public Body

Agreement for Access to Personal Information for Research or Statistical Purposes

This agreement is used only when a Proposal to Access Personal Information for Research or Statistical Purposes ("the Proposal") has been approved. The Proposal must be appended to this agreement and forms part of the agreement.

BETWEEN: _____
Name of Researcher

AND: _____
Name of Public Body

Description of Research Project

The research project for which the accessed records will be used is referred to in this agreement as:

Details of the purpose of the research, how the information will be used, and linkages that will be done are included in the Proposal.

SA 115 (2009/05)

Records Requested

Only those records requested in the Proposal will be provided ("the records"). Any changes or additions to the list must be made in writing and will require approval in writing from

_____

Name of Public Body

Clarification of the records requested is shown below if required.

In the event that there is a difference between the records requested above and the records requested in the Proposal, the information about records requested in this agreement governs the agreement.

The expiry date for access to the records listed in the Proposal and this Agreement is _____

(year/month/day)

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Fee

The Researcher is responsible for paying any fees incurred by

_____
Name of Public Body

to search for, copy and or provide the records.

The estimated fee is $ _____.

The Researcher understands that this estimate may be revised at any time by

_____
Name of Public Body

and any revision will be made in writing.

Approval of Terms and Conditions of Access

_____
Name of Public Body

approves the following terms and conditions of access.

_____
Name of Public Body

reserves the right to withdraw access to the records without prior written notice if this becomes necessary under the Act.

Terms and Conditions of Access

The Researcher understands and will abide by the following terms and conditions:

Security

1. The Researcher is responsible for maintaining the security and confidentiality of all personal information found in or taken from the records.

2. The Researcher, and only the following persons, will have access to this personal information in a form that identifies, or could be used to identify, the individual(s) to whom it relates:

_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Before any personal information is disclosed to the persons listed above, the Researcher will obtain a written agreement from each of them to ensure they will not disclose that personal information to any other person and will be bound by all terms and conditions of the present agreement. The Researcher will keep a copy of each such agreement, and will provide

_____
Name of Public Body

with a photocopy of each agreement.

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3. None of the records (including copies of them or notes containing personal information taken from them) will be left unattended at any time, except under the conditions described in Clauses 4, 5 and 6, below. If the Researcher is using the records on the premises of

_____
Name of Public Body

the Researcher will comply with the security procedures of

_____
Name of Public Body

4. Any copies of the records and any notes which contain personal information taken from them will be kept at the following address(es):

_____ _____
_____ _____
_____ _____
_____ _____
_____ _____

No records will be removed from the above premises without the prior written consent of

_____
Name of Public Body

5. Physical security at the above premises will be maintained by ensuring that the premises are securely locked, except when one or more of the individuals named in Clause 2 are present, as well as by the following additional measures (e.g. locked filing cabinet):

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Security Continued

6. Individually identifiable information from the records will be maintained on a computer system to which users, other than those listed in Clause 2, have access.

   ☐ Yes ☐ No

   If yes, access to the information will be restricted through the use of passwords and by other computer security measures that prevent unauthorized access, and can trace such unauthorized access, including the following methods:

7. _____
   Name of Public Body
   will be permitted to carry out on-site visits and such other inspections or investigations that it deems necessary to ensure compliance with the conditions of this agreement.

Use of Personal Information

8. Personal information contained in the records will not be used or disclosed for any purpose other than the research project described in the proposal (including additional linkages between sources of personal information), nor for any subsequent purpose, without the express written permission of

   _____
   Name of Public Body

9. Papers or any other works which describe the results of the research undertaken will be written and/or presented in such a way that no individuals referred to in the records can be identified and no linkages can be made between any personal information found in the records and personal information that is publicly available from other sources. There will be no exceptions to this rule without prior and specific written permission from

   _____
   Name of Public Body

10. Any case file numbers or other individual identifiers to be recorded on computer will be created by the Researcher or one of the persons listed in Clause 2 and will not relate to any real case numbers found in the records. Any such identifiers are to be used for statistical purposes only.

11. No case file numbers or other individual identifiers assigned for the purposes of the research project will appear in any other work.

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Use of Personal Information Continued

12. No personal information that identifies or could be used to identify the individual(s) to whom it relates will be transmitted by means of any telecommunications device, including telephone, fax, cable, and wireless communication networks.

13. Unless expressly authorized in writing by

_____
Name of Public Body

no direct or indirect contact will be made with the individuals to whom the personal information relates.

14. Individual identifiers associated with the records, or contained in copies of them, will be removed or destroyed at the earliest time at which removal or destruction can be accomplished consistent with the research purpose. At the latest, this will occur by: _____.
(year/month/day)

Any extension to this time limit must be approved in writing by

_____
Name of Public Body

The removal of individual identifers will be done in a manner that ensures that remaining personal information (including any found in research notes) cannot be used to identify the individual to whom it relates. **If necessary, this will be done by destroying copies of records or pages of notes in their entirety.** All destruction or removal of individual identifiers will be confidential and complete in order to prevent access by any unauthorized persons.

15. The Researcher is responsible for ensuring complete compliance with these terms and conditions. In the event that the Researcher becomes aware of a breach of any of the conditions of this agreement, the Researcher will immediately notify

_____
Name of Public Body

in writing.

16. The Researcher understands that the *Freedom of Information and Protection of Privacy Act* specifies that a person who under the Act wilfully contravenes the Act's requirements for collection, use and disclosure of personal information is guilty of an offence and liable to a fine of up to $10,000. In addition to liability for an offence, the Researcher understands that

_____
Name of Public Body

may take legal action against the Researcher if there is contravention of the terms and conditions of this agreement.

17. Written consent of

_____
Name of Public Body

must be obtained prior to the transfer of this agreement to another person, or a change in the use of the information is implemented. Consent may be arbitrarily withheld at the sole discretion of

_____
Name of Public Body

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Use of Personal Information Continued

18. _____
Name of Public Body

will receive a copy of the final research product.

Signed at _____ , on _____
City/Town/Village Date

_____ _____
Signature of Researcher Signature of Witness

_____
Name and Position of Witness

_____ _____
Signature of Authorized Official of Public Body Date

_____
Position

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Privacy & Information Management

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Effective information and privacy management directly supports all aspects of your business and reputation. Because information is about people and relationships and successful, reputable organizations are built on trust with those people.

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Any organization, public or private, that stores information; whether it's about business transactions, employees, customers, clients, patients or students, is obligated to consider a privacy and information management strategy.

Creating and using information resources safely and effectively isn't easy: complex data, security threats, records retention, right of

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Cenera
1100, 1015 – 4 Street SW
Calgary, Alberta, T2R 1J4
(403) 290-0466

Useful links

Privacy & Information Management Services
Privacy Impact Assessment
Privacy & Policy Programs
Information Management and Governance
Expert FOIP Support
Training & Upcoming Events

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access requests, consent, avoiding and responding to breaches – these are growing and constant challenges subject to ever-changing regulations.

If you have an internal or external breach of privacy, mishandle information or lose control of your information, you may face costly consequences including regulatory sanctions, monetary penalties and reputation damage.

We're here to help ensure that never happens.

Cenera's Privacy and Information Management team can help you:

- Understand federal and provincial access privacy policies
- Organize and identify your information more efficiently
- Complete a Privacy Impact Assessment
- Train your teams to better manage privacy and information issues
- Undertake a gaps reports to identify shortfalls
- Establish and maintain processes to help you in the long term

We regularly undertake half and full-day training on all aspects of Privacy and Information Management. You can find up-coming events here.

Contact us to take the first step in understanding your Privacy and Information obligations.

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"Cenera provided excellent career transition services. The courses were very helpful, especially Start Your Own Business, financial planning and resume building. My overall experience with Cenera greatly surpassed my expectations. I am grateful for the help."

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The VillAGE Initiative

The Future of Aging in Community

Smart Cities Challenge—FINAL PROPOSAL

Ville de Côte Saint-Luc City of

SMART CITIES CHALLENGE

Canada

SmartCSL.org 5801 Boul. Cavendish Blvd., Côte Saint-Luc, Quebec Canada

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APPENDICES A1

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EXECUTIVE SUMMARY

In the face of a rapidly aging population, the City of Côte Saint-Luc will implement a connected framework, leveraging smart devices and related technologies that will empower seniors to: (1) live more safely and independently in their homes; (2) be better connected to their communities and city services; (3) be more socially engaged, improving the overall well-being and quality of life for older adults and reducing stress on families and caregivers, the healthcare system, and long-term care facilities.

THE RIGHT PLACE AT THE RIGHT TIME

Côte Saint-Luc is a city of approximately 34,000 people, of which a third are seniors (age 65+). According to Statistics Canada projections, that proportion represents where Canadian society is heading over the course of the next few decades. Our community, which has been committed to improving the health and well-being of older adults through a variety of programs and services, is therefore the ideal ground upon which to test new initiatives related to aging.

The demographic shift will place an unprecedented strain on the health care system, both in terms of cost and, also, resources. In an effort to adapt to future demographics and improve the continuum of care, new solutions are being explored by the health system that will break down compartmentalization and bring care to where the patient is. Digital health is the future, and the Smart Cities Challenge has presented an opportunity for Côte Saint-Luc to lay the foundation for a partnership that will deliver better patient care to the home. What we have before us is the perfect opportunity, at exactly the right time, in the ideal place.

OUR VISION

The VillAGE Initiative is the future of aging in community. It operates simultaneously in the domains of technology and social transformation, and uses a Design-Thinking approach that continuously engages people and enables us to create appropriate and relevant services that meet the needs of older adults. With a focus on prevention, the Village Initiative is positioned to support the health sector while leveraging the trust and relationships that exist between people and their community.

Participants will have a single entry point, where initial intake and onboarding is done. A professional will make an assessment of his or her need and propose solutions from a menu of interventions or services. These interventions include everything from the installation of technology for safety and convenience in their home, to social prescription, to participation in the VillAGE Community App. Privacy will be a core principle by which the VillAGE Initiative is designed and operated, as will scalability.

The long-term impacts of the VillAGE Initiative will be felt on multiple levels. Older adults will see an increase in their autonomy, and feel more secure living in their homes. Social isolation will be reduced. The families of older adults will gain peace of mind and experience reduced stress. Community capacity, connectedness and wellness will be improved. In the health and social services domain, the timeliness of care will be improved and placement delayed.

GOVERNANCE AND PARTNERSHIPS

In setting up the VillAGE Initiative, we will create a federal non-profit organization (NPO). The decision to establish a NPO with a Governing Board and its own staff, rather than run the program directly through the City was based on many considerations which include: the size of the project, reduced interference from electoral cycles, more flexibility in terms of procurement and labour, and the ability to apply for a variety of grants. The City will, however, maintain some governing control,

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with two elected officials on the Governing Board, and approval rights over the budget.

The Governing Board, totalling nine people, will be made up of independent members from a diverse and relevant range of backgrounds. The NPO will be led by a CEO and a Management Team, who will set up and manage the entirety of the VillAGE Initiative. A Technology Partner will act as the CTO and be responsible for the whole of the technology domain, platform development, and related partnerships.

A rich ecosystem of partners, including all levels of government, researchers, health sector representatives, private industry, community groups, and residents will collaborate to address the complex and widespread challenges our society faces related to aging. Côte Saint-Luc will be the epicentre for innovation—a Living Lab where senior health and aging will be studied, and solutions tested with residents, in the real world.

- The City of Côte Saint-Luc will be intimately involved in the development and implementation of the VillAGE Initiative through such means as providing space and in-kind services, co-developing programs, and cross-promotion.
- Our research partners at the Institut universitaire de gériatrie de Montréal and at the Université de Sherbrooke have already helped develop the VillAGE Initiative, and they and other research groups will continue in this role.
- Our health partners at the Ministère de la Santé et des Services sociaux and the CIUSSS West-Central (Regional Health Board) fully support the Initiative and will leverage it to develop their technological roadmaps and further their goals.
- MEDTEQ will support the VillAGE Initiative through in-kind contributions of expertise and funding.
- Other partners will add expertise and collaborate with the VillAGE Initiative in their respective domains.

HOW IT WILL RUN

The VillAGE Initiative was distilled into five main projects, or project categories. Each of these contain several activities. The projects are:

1. **Governance and Operations**
2. **Community Engagement & Social Transformation**
3. **Platform Development**
4. **Service Delivery**
5. **Sustainability and Transferability**

The short-term outcomes associated with the VillAGE Initiative activities include:

- Awareness of the VillAGE Initiative—measured by the number of people informed about the project through communication efforts;
- Participation in Community Engagement—measured by the number of people who reach out and participate in community Engagement activities;
- Active involvement of community in service design—measured by the number of people engaged in the design and testing of products and services;
- Adoption of Products and Services—measured by the number of people onboarded and who have adopted at least one product or service;
- Participant satisfaction—measured by survey results from participants, stakeholders, and data from the platform.

Mid-term outcomes include:

- Improved digital literacy in older adults;
- Improved safety in the home;
- Improved function and autonomy;
- Improved perception of personal physical and mental well-being;
- Increased social connections;
- Better communications between seniors and their families;
- Reduced mechanical falls and increase in fall efficacy.

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EXECUTIVE SUMMARY

ATIA - 21(1)(b)

The VillAGE Initiative has an implementation plan that dictates the scheduling, sequencing, and dependencies for each activity, their outputs and deliverables, and those responsible for carrying them out. In the first year, a series of plans will be generated that set the foundation for the proper management of the Initiative.

THE TECHNOLOGY

Aging in place technology is the fastest growing sector in the longevity economy. The marketplace is filled with a dizzying array of options that seniors can choose from. During the finalist phase of our project, we consulted with residents to discover their needs, then researched and evaluated a number of solutions that could meet those needs. We created an evaluation criteria, and in the end selected the most suitable technologies to use in our pilot project.

The Pilot Project

[redacted] DOMotics at the Université de Sher- : home solution was chosen as the for the pilot project. Based on open it consists of small passive sensors, dded Amazon's Echo and a floor light erbrooke team helped us install the homes of pilot participants. We also ac Look Watch for safety on the go. inues until May 2019, but so far, we interesting data and will use what we learned to shape our future service delivery.

The VillAGE Platform

The VillAGE Platform will allow seniors to access resources in three categories for help when they need them: convenience, safety, and social connectedness and engagement. The vision and architecture for the Connected Technology Framework is based on the principles of open technologies, great experiences at home and on the go, smart automation, interoperability, and privacy and security.

LISTENING TO OUR COMMUNITY

Community engagement is at the heart of the VillAGE Initiative, and it has shaped every aspect of this Final Proposal. Our research partners at the Université de Montréal and the CIUSSS Centre-West helped us structure our community engagement, which consisted of focus groups, public consultations, and a senior advisory council that consulted the seniors themselves, caregivers, staff who work with seniors, future seniors and the general public.

A Community Engagement Plan s [redacted] whereby residents were given op various levels of participation. We as challenges to aging in place, perce nology, what the City can leverag concerns. We informed residents a were trying to do, consulted on the sulted on their impression of prop collaborated with them, and finall them through inclusion in a pilot prc

For the next phase of the VillAGE Initiative, we will add four principles to our community engagement approach: outreach, participation, user-friendly material, and a Design-Thinking model, which will enable residents to co-design and test products and services. In laying the foundation for a VillAGE Community App, many community-building social innovations will be tested. Other community engagement activities include: pop-up workshops, listening sessions, showcases, interviews, thrivability sessions, and more.

DATA AND PRIVACY

The VillAGE Initiative is deeply committed to implementing the highest standard of privacy and data protection. Sharon Polsky, privacy expert and President of the Privacy and Access Council of Canada, worked with our team to develop measures that will ensure that we depart from a point of Privacy By Design, going beyond the baseline and allowing participants to maintain control over the information. A Data Governance and Privacy Protection Policy will be created at the very beginning of the project.

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EXECUTIVE SUMMARY

FINANCIALS

Our Projected Financial Plan reflects the planned funding strategy through which the VillAGE Initiative will be financed. This includes the $10 million start-up fund financed by Infrastructure Canada through 13 milestone payments, and revenue generated from number of sources to ensure sustainability and scalability in the long-term. These include:

- Partner support, most importantly from MEDTEQ and potentially from the Quebec Ministry of Health and Social Services;
- Subsidies, research grants, government grants, foundations;
- Smart device solution sales;
- Fundraising;
- Planned giving and endowment funds;
- Solution support services.

OTHER CONSIDERATIONS

In conjunction with our economic development partners, we will integrate diversity and inclusion into our future project team. We will also further consult with the Indigenous groups in our region and make a strong effort to contact our own local Indigenous population.

In addition, we will ask the provincial government to expand its home adaptation programs to include smart technology devices as part of the program.

CONCLUSION

We believe in the transformational power of the VillAGE Initiative, not just for older adults and their families, but for Canadian society at large. Through a strong governance model, important partnerships, community involvement, technology and social innovation, solid privacy policies and sound management, we will bring the project to life and change the future of aging in community.



conducted more than 15 commu-
ent events with more than 1,000
November 2018 to January 2019.
etters to 14,000 households with
out the project and an invitation to
the public consultations.

good use of typical/tailored method of comm.

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Chapter 1 VISION

ATIA - 21(1)(b)

1.1 CONTEXT

Across the country, the population is aging. The number of older adults as a percentage of the population is increasing, and life expectancy is rising. Canadians face many challenges in light of this, at the individual and family level, the community level, and of course, in terms of the health care system.

Our society has not been designed around older adults or the challenges that they face, such as how and where to live safely and independently, how to easily get around, how to carry out the instrumental activities of daily living (IADLs), and [redacted] ite in community life in a meaning-

[redacted] ng a part of society increasingly [redacted] plugged in' to technology, some- [redacted] ny of the current older adults are [redacted] e with and/or cannot easily use or [redacted] ough there is an avalanche of new [redacted] geted products and smart home [redacted] evices being pushed at them. This [redacted] ier challenge, another obstacle for older adults to overcome.

Isolated people do not recover as well from illness as people with meaningful connections. They are more likely to get sick, get depressed, and die at a younger age than those who are surrounded by people they can count on. Many older adults have children who live in other cities and/or who lead busy lives and they don't want to impose on them.

As we have seen with our own first responder service and in public consultations, 9-1-1 is often the go-to place for people who have an issue and few people to turn to. Many older adults attempt to get some of their needs met through city services such as the public library or recreation department, as they do not feel they could rely on social services. In some cases they cease to participate in civic life altogether, due to reasons such as access to transportation, or for reasons as mundane as being blocked in by a snowy walk that they can no longer shovel themselves.

1.2 OUR JOURNEY

In our preliminary proposal to the Smart Cities Challenge, entitled SHARED (Senior Health and Real-time Environmental Data) we addressed social isolation mainly in terms of security. In that vision, an isolated older adult would have more confidence about living autonomously with the knowledge that the city was looking out for their well-being, and that there would be a nuanced response to what would happen to them inside their dwellings and outside in the community. All of this was fueled by artificial intelligence (AI) enabled technologies in the home and in community. Environmental sensors were part of the vision as well. Noise and air pollution are key factors in the environment and have an impact on wellness, especially in vulnerable populations.

The spirit of the original vision of the 'SHARED' proposal has been preserved at its core, but after extensive public consultation and research, we deepened our understanding of the array of challenges older adults face, including meeting their daily needs and getting access to the health and social services they require.

At the public consultations, we learn[redacted] adults were concerned not simply w[redacted] security as we originally understoc[redacted] social engagement and a desire for [redacted] tasks of daily living. With some mo[redacted] our original vision, we could have a[redacted] er impact on the reduction of social [redacted] helping our residents age in commu[redacted]

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ATIA - 21(1)(b)

1.2.1 Our revised Challenge Statement

In the face of a rapidly-aging population, the City of Côte Saint-Luc will implement a connected framework, leveraging smart devices and related technologies that will (1) empower older adults to live more safely and independently in their homes; (2) be better connected to their communities and city services; (3) be more socially engaged, improving the overall well-being and quality of life for older adults and reducing stress on families and caregivers, the healthcare system, and long-term care facilities.

The name of the initiative in our preliminary proposal did not reflect the amplitude of the new vision, which is why we changed it to the VillAGE Initiative. The environmental monitoring that we outlined in the preliminary proposal, while important, was not a top priority for our residents and not at the heart of issues that face our existing and future older adults. The VillAGE Initiative team opted to position environmental monitoring as one of the activities in the longer-term.

In the City of Côte Saint-Luc, 30 percent of our population is age 65 or older, which means that our community already reflects the future demographics of Canada. The issues of social isolation, safety, and the challenges of aging in place are very real for our residents as they are for those in [redacted] nities across the country. When the eam discusses the project publicly, is overwhelmingly positive and al- sonal. Everyone has a story about a r who fell, or would have benefitted ces we discuss.

[redacted] versal fact and process. Every com- ry province has to address it in such isure that their residents thrive in the face of it.

1.3 THE PROPOSAL

> **“It takes a village to raise a centenarian.”**
>
> — Susan Pinker, *The Village Effect*

The VillAGE Initiative is the future of aging in community. While the city is where the interface occurs with the older adult, it is only one player with many partners who work in tandem to reduce isolation, increase safety, and increase engagement and well-being. The VillAGE Initiative operates simultaneously in two domains (see figure 1-1):

1. Technology
2. Social Transformation

The teams will work together and use design-thinking methods with continuous community engagement and feedback. The teams will also work with partners to co-create services and t[redacted] ing labs. The feedback from the pul[redacted] the service delivery at every stage, [redacted] what we offer is relevant and impact

Participants will have a single entry [redacted] initial intake and onboarding is done. [redacted] tiative social worker will assess the p[redacted] and preferences, and propose solu[redacted] menu of interventions or services. [redacted] clude the following:

- Home assessment, where a professional assesses the dwelling, flags hazards and identifies ways to improve safety and reduce falls.
- The installation of sensors and safety devices in the home, plus the verification and/or installation of smoke- and CO-detectors.

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ATIA - 21(1)(b)

- The installation of convenience technology in the home, to help with IADLs.
- Provision of smart wearables for safety on the go.
- Signing up for the VillAGE App, to connect older adults with vetted community members and city services to help with IADLs.
- Referral to existing city and community services.
- Social prescription.
- Education and training for technology.

The orientation of these services is towards **prevention**. In this way, these services support, rather than supplant the health sector.

Municipalities are the closest level of government to the population and can therefore have the most direct impact on lifestyle and well-being. The role of a city, apart from delivering routine services, is to create an age-friendly environment and to build and foster community. Residents trust their local elected officials and the staff that they interact with on a regular basis. Cities can leverage that trust to reduce isolation and improve health. The VillAGE Initiative would harness those relationships and then add to it more layers and more connections.

1.4 OUTCOMES

The long-term impacts of the VillAGE Initiative will be felt on several levels:

- **Older adults** will be less socially isolated and participate more socially. This will enhance quality of life and well-being. They will also be able to age in place for longer.
- **Families and caregivers** of older adults will have more peace of mind and benefit from a reduced burden and stress perception.
- **City services:** Use of existing city services will increase and the City will earn the Age-Friendly Community designation from the Public Health Agency of Canada. Community capacity, connectedness, and community wellness will be improved.
- **Health and social services:** The timeliness of care will be improved, and there will be a reduction in lower priority emergency calls, with a corollary reduction in hospital admissions. Placement into senior residences will be delayed, and the trajectories of care will be vastly improved, as there will be an integration of community, city and social and health care services. Older adults will receive the right services at the right place at the right time, at a more reasonable cost. The VillAGE Initiative will be aligned with the regional health network in terms of roadmap, data integration, and information privacy protection.
- **The City of Côte Saint-Luc** would become a Living Lab/innovation hub that will advance knowledge with its research part ciplinary innovation will break d sulting in a systems change with relationships in the community, n new structures, new policies, anc delivery in existing programs. As would ripple out across the cou and perceptions of older adults and aging will become a differe for older adults of the future.

[redacted]

1.5 PRIVACY

The VillAGE Initiative is committed to the highest standard of privacy and data protection. Privacy By Design is built into the VillAGE Initiative and will become the standard for other Canadian cities that adopt this program. This will put Canadian cities on the map for the Cities Coalition for Digital Rights, a world initiative to promote and track progress in protecting residents' digital rights in cities[1].

[1] See Bianca Wiley (@ biancawylie) Senior Fellow at the Centre for International Governance Innovation and co-founder of Tech Reset Canada "Why we need to push for data rights in Canada." https://business.financialpost.com/technology/why-we-need-data-rights-not-everything-about-us-should-be-for-sale

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1.6 SCALABILITY & REPLICABILITY

On the technology side, the VillAGE Initiative is scalable and replicable by design. The menu of services offered can be scaled up or down depending on community resources and the needs of the individual using the services. The basic model of service delivery is the following:

Community Engagement > Intake > Menu of Services > Delivery of services

This model is transferable anywhere in the country. The services and products that we selected are suited to our community at this time, but each city can use the ones it wants from a list that will evolve over time, given the fast-paced evolution of available technologies. The number of services offered can vary or can be added to, depending on the resources available.

The VillAGE Initiative will use technology platforms that are open-source and tool agnostic, This renders the platforms accessible to others and future-proof, as new devices are developed and others become obsolete. All hardware will be easily available, off-the-shelf items, which will minimize the cost of the devices and increase their accessibility.

The value added by the VillAGE Initiative is in the integration platform connected to City and health and social services. This platform will be constantly developing in response to the user experience.

One the social transformation side, most communities already have staff and volunteers who can provide services as described or with local variations. For instance, many public libraries offer technology training for older adults. These programs could be marketed differently as part of an initiative such as this one, or be prescribed, or be tweaked so as to be more accessible (e.g., take the class to the senior residence, or arrange transportation). Not every service need be completely new.

Innovation and design-thinking drive both the technology and social transformation domains of the Village Initiative. We will assess the services and other projects for outcomes and usability—in a continual feedback loop with the end users. Our research partners will help us develop and assess the services and projects. Once we have set up the Village Initiative, delivered the services, learned from our mistakes, and determined the best practices, we will create a guide for other communities so they can replicate what we have done.

1.7 THE ORGANIZATION MODEL AND FLOW OF THE VILLAGE INITIATIVE

The VillAGE Initiative, a non-profit organization, has two main domains out of which all activities and service delivery flows: technology and social transformation. It is overseen by a Governing Board and run by a senior management team. Community engagement, done continually using design-thinking and Agile models, informs all aspects of service delivery.

Research partners, with whom co-creation and living labs will grow, will feed the technology and social transformation domains. On the technology side, digital health and tech solution partners will collaborate and support research and development. On the social transformation side, the City of Côte Saint-Luc is the primary partner, and the one who will also work on the PAD program.

Community partners will work with the VillAGE Initiative as well. There is an initial intake for service delivery, where dossiers are created and users are assessed and then prescribed services from a menu. These services include: referral to existing city and community services, social prescriptions, education and training workshops, home assessment, the VillAGE App, tech safety and tech convenience, a public dashboard, and support from a help desk. Apart from providing services directly to users, the tech and social teams will have platform development, environmental monitoring, and the establishment of an age-friendly city.

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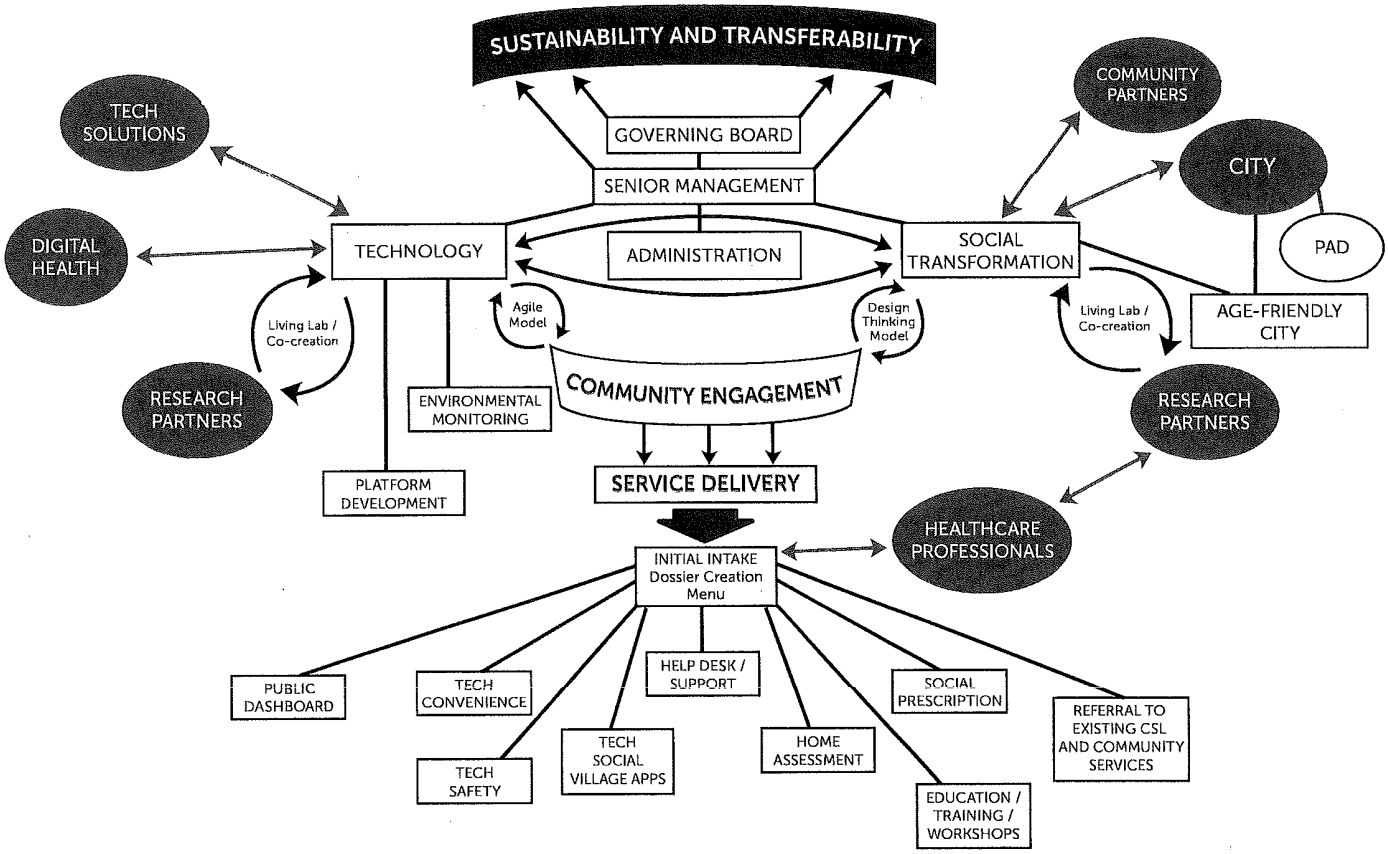


Figure 1-1: Organizational model

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Chapter 2 PERFORMANCE MEASUREMENT

Performance measurement is key for understanding, managing and improving what the VillAGE Initiative will be doing. It is a continuous improvement operation which involves checking the performance against that benchmarks. The VillAGE Initiative performance measurement plan uses results-based management principles by:

- Focusing on performance and achievement of outputs, outcomes and impacts.
- Monitoring progress toward the achievement of expected results.
- Integrating lessons learned into decision-making.
- Regular reporting on performance.
- Working beyond processes, activities, products and services to focus on the actual social and economic benefits of projects and programs at the level of beneficiaries.
- Working harmoniously and cohesively to be effective.
- Focusing on sustainable achievements rather than short-term results that have a long-term impact on the lives of people.

2.1 PROJECT ACTIVITIES AND THEIR LINK TO OUTPUTS AND OUTCOMES

The VillAGE Initiative was distilled into five main projects, or project categories. Each of these contain several activities, into which go a number of outputs. The projects are:



Figure 2-1: The five main projects or project categories

Project 1—Governance & Operations

The first project involves setting up the entire framework for the VillAGE Initiative, creating the non-profit organization, hiring the team, formalizing partnerships, planning, creating systems, and creating policies and procedures.

Project 2—Community Engagement & Social Transformation

This project involves a series of activities, including creating a community engagement plan and an age-friendly city plan, in addition to implementing a series of community engagement activities. It also includes a neighbourhood development strategy and activities that lay the groundwork for the VillAGE Community App to be developed.

Project 3—Platform Development

The development of the platform, applications, and smart device technology begins in the first year and goes on until the end of the five years. The technologies being developed are the foundation upon which service delivery will be based.

Project 4—Service Delivery

For our residents, this project *is* the VillAGE Initiative. It involves planning, hiring staff, setting up a delivery point, service design, procedure development, coordination with existing partners, developing a campaign, and launching actual service delivery.

Project 5—Sustainability & Transferability

The final project involves creating and implementing a sustainability plan, expanding existing provincial programs, and creating a guide with best practices for other cities.

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Chapter 2 PERFORMANCE MEASUREMENT

The Logic Model (see Figure 2-2) is a summary of the activities and intended qualitative and quantitative outcomes and will guide the development and improvement of the VillAGE Initiative. It identifies the Challenge Statement and definition of the target audience, as well as secondary audiences, and focuses mostly on service delivery to the residents, as the other projects and deliverables are covered in the GANTT chart and in the Project Management section of this proposal. The model has been created to visually represent the underlying theory and logic of the VillAGE Initiative's service delivery, and to demonstrate how project activities are linked to outputs, short-term outcomes, medium-term outcomes and long-term impacts for individuals and society.

Outputs refer to measurable, immediate deliverables and/or the amount of product/service that is produced or delivered. **Short-term outcomes** refer to new learning and knowledge or change in attitude and skills among the audience. **Mid-term outcomes** refer to changes in behaviour and action that result from this new knowledge. If activities are accomplished, outputs delivered and short and mid-term outcomes achieved, then **Long-term** impacts to older adults, families, the City of Côte Saint-Luc, the health care system and society might be expected to occur.

The outcomes-based performance measurement plan will be focused on outputs and deliverables, while the long-term impacts will be built into the sustainability plan, since it will not be possible to show these kinds of effects during the five-year period.

The Logic Model

Challenge Statement	In the face of a rapidly aging population, the City of Côte Saint-Luc will implement a connected framework, leveraging smart devices and related technologies that will empower seniors to: 1. live more safely and independently in their homes; 2. be better connected to their communities and city services; 3. be more socially engaged, Improving the overall well-being and quality of life for older adults and reducing stress on families and caregivers, the healthcare system, and long-term care facilities.
Audience	The target audience will be older residents (65+) living in Côte Saint-Luc who are beginning to experience a loss of autonomy and want to stay living at home for as long as possible while maintaining autonomy, dignity and respect. They don't need support from social services yet, but are starting to need some help. Secondary audiences will include: family and caregivers, other residents (future seniors), City staff, and Partners.
Input	Funding: Infrastructure Canada Smart Cities Challenge Equipment & Tools: Tech for convenience, tech for safety, and tech for social engagement, social prescription software Facilities: City facilities, participants' homes, office in shopping mall (as of Year 3) Human Resources: Governing Board, Management Team, Technology Partner and Technology Team, Community Engagement Service Delivery Team, Partners, City Staff, Professional services
Activities	• Governance and Operations • Community Engagement and Social Transformation • Platform Development • Service Delivery—Intake assessment, baseline metrics and referral to menu of services including: • Full home assessments and adaptation • Smart technology prescriptions and installations for safety, convenience and social engagement • Social prescriptions and referrals to City programs, activities and services in and around CSL • VillAGE Community App (people helping people) • Training and education workshops for seniors • Help desk, monitoring and support • Sustainability and Transferability

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Outputs

- Policies procedures and guidelines
- Management, Community Engagement, and Service Delivery plans
- Monthly reports to Governing Board and Infrastructure Canada Smart Cities Challenge Team
- Budget compliance
- # of engagement activities offered
- # of participants and partners engaged
- # changes made for Age-Friendly City designation
- Deployment of smart devices for older adults
- # of older adults onboarded (people reached)
- # of home assessments
- # of social prescriptions
- # of referrals to City and community services
- # of workshops offered
- Retention rate of participants
- # of people participating in the VillAGE Community App
- Implementation and best practice guide for transferability

Short-Term Outcomes

- Awareness of VillAGE Initiative (public informed about the Initiative)
- Participation level of community (public signed up to the Initiative)
- Active involvement of community in service design, feedback cycle
- Diversity of community engagement participants (representative of population groups)
- Participant satisfaction as measured by adoption, acceptability, appropriateness, feasibility/usability, efficiency, effectiveness, fidelity, and penetration level

Mid-Term Outcomes for Older Adults

- Improved digital literacy among older adults
- Improved safety in the home
- Improved function/autonomy (Instrumental Activities of Daily Living [IADLs])
- Improved perception of personal physical and mental well-being
- Better communication between seniors and families
- Increase in social connections
- Reduced mechanical falls and increased falls efficacy

Long-Term Impact

Benefits to Older Adults

- Reduced social isolation (nodes of relationships added to care map)
- Increased social participation
- Improved quality of life/wellbeing
- Prolonging ability to age in place

Benefits to families/Caregiver

- Decrease caregiver and family burden (in terms of stress, time, and quality of interaction)

Benefits to the City and the Community

- Increase in use of existing services
- Age-Friendly City designation
- Community capacity

Health and Social Service Outcomes

- Timeliness of care
- Reducing hospital admissions
- Participant experience
- Delaying placement
- Efficiency of care: Better use and integration of community, City and the social and health care services (the right services at the right place at the right time at a reasonable cost)
- Platform that others can plug into (CIUSSS digital health)

Benefits to society

- Living Lab/Innovation Hub advancing knowledge (knowledge translation, transferability)- Interdisciplinary innovation – breaking down silos
- Changing attitudes/perceptions about older adults
- Systems change – new resources, structures, new adjusted policies, improved delivery of existing programs and new working relationship in the community
- Interoperability
- Ripples to future seniors...

Figure 2-2: The Logic Model

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Chapter 2 PERFORMANCE MEASUREMENT

2.2 INDICATORS

The following tables show how each of the outcome and impact indicators are defined and how they will be measured.

Governance Indicators	Performance Measures
Organization	Extent to which the progress and compliance with requirements is being monitored and reported
Community engagement	Number of community engagement activities in which residents actively participated
Multi-level Governance	Extent to which the NPO, City, and Tech partner cooperate with each other and with authorities and partners from different levels
Budget compliance	Extent to which annual expenditures are compliant and aligned to project cost projections
Sustainability and Transferability	Extent to which economic activities have generated revenues and social activities have benefitted beneficiaries long-term

Table 2-1: Governance indications and performance measures

Community Engagement Indicators	Performance Measures
Representative	Extent of engagement participation by stakeholder groups Increased participation of vulnerable groups
Trust	Extent of competence, integrity and dependability/reliability of the engagement process
Influence	Extent of effects of project participation on community participants, and of participants on design
Responsiveness and Communication Quality	Extent to which interactions with the public are timely, helpful, and clear
Accessible	Extent of engagement and technical tools available to ensure participation & feedback
Transformative	Extent of benefits to the community participants

Table 2-2: Community engagement indicators and performance measures

Platform Development Indicators	Performance Measures
Value Delivery	Extent the support platform is intelligent, as well as customizable to user needs Extent the implementation of prototype in homes of older adults is perceived as trouble-free and efficient Extent of acceptability, usability, and adoption by users of the VillAGE platform
Risk Management	Extent of privacy protection and protection of personal data
Resource Management	Extent to which the management of resources (budget, human capital, material) have been used
Performance Measurement	Extent the support platform tracks and records user feedback and corrects technical malfunctions Extent the platform is responsive to user's feedback

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Platform Development Indicators	Performance Measures
Strategic alignment	Extent to which the platform is aligned to user needs and challenge statement
Frailty	Screen for frailty
Acceptability	Satisfaction with various aspects of the innovation (content, complexity, comfort, delivery, credibility)
Adoption	Intention, initial decision, or action to try an innovation "uptake"
Appropriateness	Perceived fit, relevance, or compatibility of the innovation
Feasibility/Usability	Actual extent to which innovation can be successfully used for its intended purpose – based on effectiveness, efficiency and satisfaction, system usability scale
Fidelity	Delivered as intended based on protocol
Implementation cost	Marginal cost; cost effectiveness; cost-benefit
Penetration	Level of "reach" or spread or service access
Sustainability	Retention, maintenance or continuation by user

Table 2-3: Platform development indicators indications and performance measures

Service Delivery Indicators	Performance Measures
Quality	Extent of tangibles (reliability, responsiveness, assurance and empathy of service)
Availability	Increase access to and use of technologies
Revenue Improvement	Extent of price adaptability of service
Customer Experience	Extent of customer understanding of service Extent of customized services
Process Cycle (time, improvement)	Extent of waiting time
Digital Literacy – Older Adults	Extent of difficulty in adapting to wearables and other related smart technologies
Safety	Increased safety in the home (Safety Assessment Scale)
Perceived Physical and Mental Health	Extent of smart-home customer expressing improved physical and mental health
Increased functional Status	Ability to perform tasks necessary to live independently in the community (Lawton Instrumental Activities of Daily Living Scale)
Improved Communication between Seniors and Families	Extent of senior's family participation months after smart home devices installed
Increased Social Connections	Frequency and quality of family, friendship and neighbour ties (Lubben Social Network Scale)
Reduced Mechanical Falls/ Increased Falls Efficacy	Falls Efficacy Scale

Table 2-4: Service delivery indicators and performance measures

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Chapter 2 PERFORMANCE MEASUREMENT

Sustainability and Transferability Indicators	Performance Measures
Economic Performance	Extent of VillAGE smart home products and memberships installed Extent of revenue sources acquired from the VillAGE Initiative
Social Performance	Extent of social impact the VillAGE Initiative has on community and users of services

Table 2-5: Sustainability and transferability indicators and performance measures

Benefits to older adults	Performance Measures
Reduced Social Isolation (nodes of relationships to care map)	Quality and quantity of social relations with at different levels where human interaction takes place (individual, group, community and the larger social environment). Frequency of face-to-face human interaction
Social Participation	Extent of satisfaction with personal and family relationships and perception of loneliness
Quality of Life/Psychological Well-Being	Psychological General Well Being Index (Dupuy)
Prolonging Ability to Age in Place	Government checklist – Are You Ready to Age in Place

Table 2-6: Benefits to older adults indicators and performance measures

Benefits to Families/Caregivers	Performance Measures
Decrease in caregiver and family burden	Caregiver risk screen
Peace of mind/perceived stress	Extent of relieved stress of caregivers

Table 2-7: Benefits families/caregivers and performance measures

Benefits to City	Performance Measures
Increase in use of existing services	Internet access for percentage of lowest income and most isolated seniors
Increase social and economic resilience of older adults and community	Connection points in the community
Age-Friendly Community designation	Extent of following guidelines of Public Health Agency of Canada
Community capacity	Community capacity scale – social capital

Table 2-8: Benefits to City and performance measures

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Chapter 2 PERFORMANCE MEASUREMENT

Health and social service outcomes	Performance Measures
Reducing hospital admissions/ Reduction in priority 3 and 4 calls	EMS data (Hospital admission is costly and often preventable)
Efficiency of care	Better use and integration of community, city and the social and health care services (the right services at the right place at the right time at a reasonable cost) Just in time indicator

Table 2-9: Health and social services outcomes and performance measures

Benefits to Society	Performance Measures
Living Lab/Innovation Hub advancing knowledge (Knowledge translation, transferability) – interdisciplinary innovation	# of white papers written by researchers and organizations on VillAGE Initiative # of cities modelling the VillAGE Initiative for seniors in their territory
Changing Attitudes/Perceptions of Older Adults	# of positive, negative and neutral stereotypes on aging changed
Systems Change – New Resources, structures, new adjusted policies, improved delivery of existing programs and new working relationship in the community	# of resources, structures, adjusted policies, improved delivery of programs and new working relationship in the community changed
Ripples to Future Seniors	# of future seniors onboard the VillAGE Initiative platform
Inter-operability	Extent to which project has increased a community infrastructure that provides services to and accept services from other community and health care infrastructures and to use the services so exchanged to enable them to operate (CIUSSS DIGITAL HEALTH)

Table 2-10: Benefits to society and performance measures

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2.3 PROJECT TIMELINES, DELIVERABLES, AND MILESTONES

The GANTT chart below focuses on timelines, deliverables, and milestones, which are easily measured and quantifiable.

Projects	Activities/Deliverables	Duration	Dependencies	Human Resources	Y1 Q1	Y1 Q2	Y1 Q3	Y1 Q4	Y2 Q1	Y2 Q2	Y2 Q3	Y2 Q4	Y3 Q1	Y3 Q2	Y3 Q3	Y3 Q4	Y4 Q1	Y4 Q2	Y4 Q3	Y4 Q4	Y5 Q1	Y5 Q2	Y5 Q3	Y5 Q4
Governance and Operations																								
	Create NPO and recruit Governing Board	6 months		Côte Saint-Luc (CSL)																				
	Establish Board rules, structure and framework	3 months	Create NPO	CSL																				
	Hiring CEO and Management Team	3 months	Establish rules	Governing Board (GB)																				
	Create policies and procedures	3 months	Hiring MT	Management team (MT)																				
	Establishing professional services	3 months	Create NPO	COO																				
	Financial plan and budget	3 months	Hiring MT	MT																				
	Sign contracts with Technology Partner	3 months	Professional services (PS)	MT, GB, PS (lawyer)																				
	Sign contracts with other partners	3 months	PS	MT, GB, PS (lawyer)																				
	Create HR management plan	3 months	Hiring MT	MT																				
	Create risk management framework	3 months	Hiring MT	MT, GB																				
	Establish outcome measurement plan	3 months	Hiring MT, partner contracts	MT, Research Partner																				
	Create data governance and privacy protection policy	3 months	Hiring MT and PS	MT, PS (Privacy expert)																				
	Develop marketing and communications strategy	3 months	Create NPO	MT, CSL																				
	Set up new location (service delivery and offices)	9 months		MT, GB, PS																				
Community Engagement/ Social Transformation																								
	Finalize CE Plan (including work with indigenous groups)	3 months	Hiring MT	DIR - CE/SD																				
	Create VillAGE Community App/neighbourhood development strategy	27 months	Finalize CE Plan	DIR - CE/SD, CEO, TP																				

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Chapter 2 PERFORMANCE MEASUREMENT

Projects	Activities/Deliverables	Duration	Dependencies	Human Resources	Y1 Q1	Y1 Q2	Y1 Q3	Y1 Q4	Y2 Q1	Y2 Q2	Y2 Q3	Y2 Q4	Y3 Q1	Y3 Q2	Y3 Q3	Y3 Q4	Y4 Q1	Y4 Q2	Y4 Q3	Y4 Q4	Y5 Q1	Y5 Q2	Y5 Q3	Y5 Q4
	Hire Community Engagement (CE) Coordinator	3 months	Governance and operations	MT, GB																				
	Implement CE Activities	Ongoing	Finalize CE Plan	DIR -CE/SD, CE Coordinator																				
	Create plan for Age-Friendly City designation	6 months	Hiring Management Team	CEO, CSL																				
Platform Development																								
	Core platform development	48 months	Technology Partner (TP)	TP, RP,MT																				
	Application development	48 months	Technology Partner	TP, RP,MT																				
	Smart device development	48 months	Technology Partner	TP, RP,MT																				
	System integrations	36 months	Technology Partner	TP, RP,MT																				
	Testing, staging, and deployment	36 months	Technology Partner	TP, RP,MT																				
Service Delivery																								
	Create service delivery plan	15 months	Hiring MT	DIR - CE/SD																				
	Create inventory of intake assessment tools	3 months	Hiring MT	DIR - CE/SD, RP																				
	Hire service delivery staff	6 months	Create SD Plan	MT, GB																				
	Design home assessment service	3 months	Hiring SD Staff	DIR - CE/SD,OT																				
	Develop help desk procedures	6 months	Hiring SD Staff	Case Managers																				
	Design education and training workshops and tools	6 months	Hiring SD Staff	Program Staff																				
	Make integration plan with existing csl and community services	6 months	Hiring SD Staff	DIR - CE/SD, CSL																				
	Create service delivery campaign	3 months	Platform development	Marketing coordinator																				
	Launch service delivery	27 months	Platform development, New location	DIR - CE/SD, RP and SD Staff																				
	Monitor results	27 months	Launch service delivery	DIR - CE/SD, RP and SD Staff																				

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Projects	Activities/Deliverables	Duration	Dependencies	Human Resources	Y1 Q1	Y1 Q2	Y1 Q3	Y1 Q4	Y2 Q1	Y2 Q2	Y2 Q3	Y2 Q4	Y3 Q1	Y3 Q2	Y3 Q3	Y3 Q4	Y4 Q1	Y4 Q2	Y4 Q3	Y4 Q4	Y5 Q1	Y5 Q2	Y5 Q3	Y5 Q4
Sustainability and Transferability																								
	Finalize sustainability plan (revenue model inc. user fees, grants, partnerships, etc.)	48 months	Hire Management team	MT, GB																				
	Create and implement fundraising plan	33 months	Hiring Fundraising	Fundraiser																				
	Lobby to expand PAD program to include Smart Homes Devices	21 months		CEO, CSL, RP																				
	Implement sponsorship and partnership revenue agreements	27 months		COO																				
	Create implementation and best practice guidelines for transferability	6 months	platform development, service delivery	MT, GB, RP																				
	Guidelines and framework for licencing VillAGE solution to other cities	6 months	platform development, service delivery	MT, CTO																				

Table 2-11: Implantation plan

2.4 PAYMENT SCHEDULE

The VillAGE Initiative will only be able to be established with the senior staff and extensive legal support in place, out of which everything else will flow. Most of the Governance and Operational set up will occur in the first year, so we would request the first payment to be 'seed capital' covering our first 12 months of operations in order to make that possible.

Outcomes-Based Performance Measurement - Milestones and Payments		Y1	Y2				Y3				Y4				Y5			
Category	Description	Seed capital	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Awareness of the VillAGE Initiative	This is the number of people that would gain awareness of the VillAGE Initiative through our marketing efforts to our population of approx. 34,000 residents.		5,000		5,500		6,000		6,500		7,000		7,500		8,000		8,500	9,000
Participation in Community Engagement	This is the number of people who reach out and participate in our Community Engagement activities.		200		300	350	400		500	550	600		650	750	800		1,000	1,250

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Outco	[redacted] ilestones and Payments	Y1	Y2				Y3				Y4				Y5			
Categ		Seed capital	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4
Desig Works	of people who are engaged ng of products and services GE Initiative, including: * Social Transformation/VillAGE Community App * Technology for the Home * Technology for On the Go * Technology for Social Engagement * Technology for Healthcare Integration		50		125		150		175		200		225		250		275	
Adoption of Products and Services	This is the number of people who are onboarded into the VillAGE Initiative and have adopted at least one product or service, including: * Social Transformation/VillAGE Community App * Technology for the Home * Technology for On the Go * Technology for Social Engagement * Technology for Healthcare Integration						50		100	250	300		350	600	650		850	900
Benefits Derived from Adoption	Results will come from surveys, data from the VillAGE Platform, and stakeholders, including: * Improvement in convenience * Improvement in safety * Improvement in communication * # of new connections * Decline of social isolation * # of needs/incidents responded to * Need/incident response time * Improvement in overall health and well-being						38		75	188	225		263	450	488		638	675
	Milestone Payment	$1,061,000	Q1 $762,000				Q1 $1,229,500				Q1 $1,229,500				Q1 $1,262,000			
			Q2				Q2				Q2				Q2			
			Q3 $457,200				Q3 $737,700				Q3 $737,700				Q3 $757,200			
			Q4 $304,800				Q4 $491,800				Q4 $491,800				Q4 $504,800			

Table 2-12: Outcomes-Based Performance Measurement with the milestones and payment schedule

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Chapter 2 PERFORMANCE MEASUREMENT

2.5 RISK STRATEGY AND MITIGATION

Risks	Mitigation Plan
Basing performance indicators only on quantitative data	Ensure that qualitative indicators are measured as well (through interviews, surveys, focus groups, and observation)
Lack of validity and reliability of outcomes	Ensure reliable and valid tools are being used and use multiple methods to triangulate the results.
Medium- and long-term outcomes may not be achieved for many years	Ensure service delivery starts on time Focus on showing medium- to long-term outcomes in sustainability plan.
Not being able to collect baseline metrics	Ensure evaluation tools are built into the platform on time
Not meeting timelines	Establish clear monitoring and reporting of deliverables based on dependencies Report on works in progress to the Governing Board on a monthly basis. Establish clear status reporting between Platform Development and Service Delivery

Table 2-13: Risks and mitigation plan

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Chapter 3 PROJECT MANAGEMENT

Proper project management will ensure that the people responsible for bringing the VillAGE Initiative to life stay on course and are accountable for delivering on the promise so awaited by our public. This chapter outlines a variety of strategies and tools for the organization to use related to resource assessment, risk identification and mitigation, communication and monitoring.

3.1 PROJECT SCOPE, SCHEDULING, SEQUENCING, AND DEPENDENCIES

The VillAGE Initiative consists of five main projects, with several activities outlined in each. The GANTT chart (Figure 2-11) in Chapter 2—Performance Measurement indicates the scheduling, sequencing, and dependencies for each activity, in addition to the human resources, and the schedule of deliverables/outputs.

3.2 RESOURCE ASSESSMENT

Human Resources

A Human Resources Management Plan will be created by the Management Team that will outline the following:

- Individual and team roles and responsibilities for each of the projects and who will be responsible for all the hires
- A recruitment strategy
- Onboarding procedures and documentation
- Job descriptions with performance expectations
- Team-building programs
- Training programs
- Development of policies and procedures
- Performance Assessment and roll out plan

During the implementation phase of the Governance & Operations project, the HR Plan will be used for the acquisition, onboarding, training, and development of human resources.

The Organizational Chart below (see Figure 3-1) illustrates the structure of the VillAGE Initiative. Closely mirroring the Organizational model (Figure 1-1), it ties the actual staff positions to Initiative activities. While the CTO technically has a separate technology team, they are included in this chart as they are funded by the Smart Cities Challenge, and will work very closely with the community engagement and service delivery teams. The roles of the Management Team are outlined in the Governance Chapter.

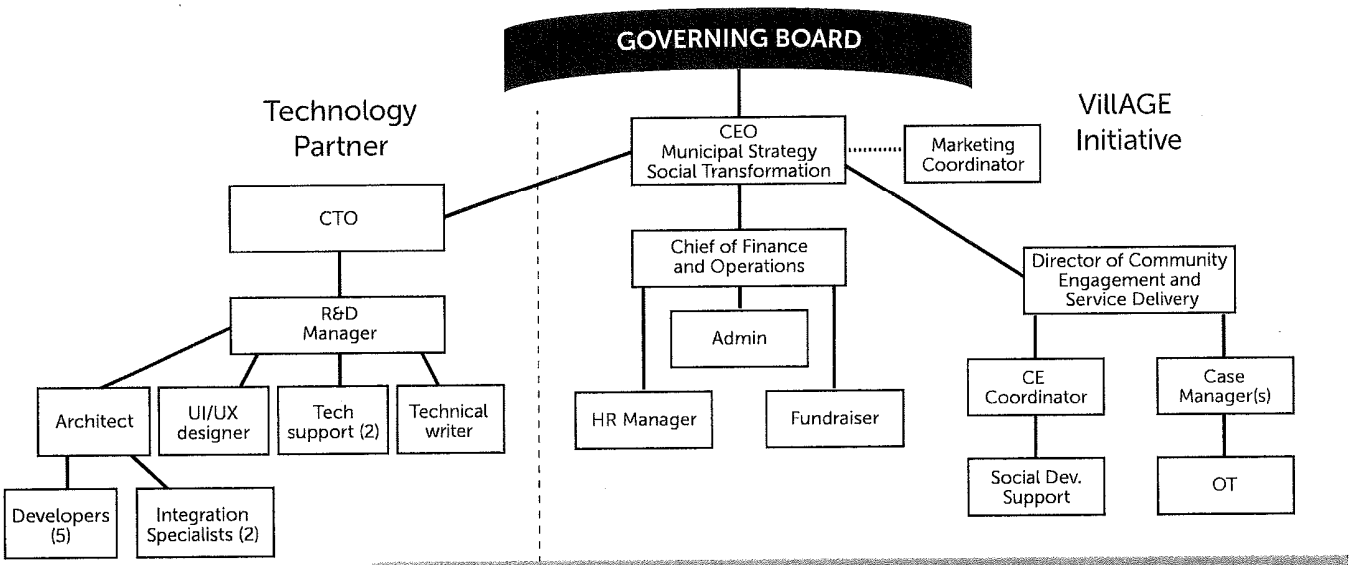


Figure 3-1: Organizational chart

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3.3 MATERIAL & FINANCIAL RESOURCES

Many material resources will be provided by the City of Côte Saint-Luc. This includes IT systems, marketing and communications resources, space for community engagement, and office space for the first few years. The infrastructure for service delivery is also well-established within City departments, whose resources can be tapped when required. This includes the Library, the Parks & Recreation, Public Safety (including EMS and vCOP). All financial resources are explained in the Financial Chapter.

3.4 STRATEGIES

Risk Identification & Mitigation

A Risk Management Plan will be created by the Management Team in the first year that will outline the following:

Roles and Responsibilities for Risk management

- Methodology
- Risk categories
- A Risk Breakdown Structure (RBS)
- Cost Management Plan
- Risk probability and impact assessment
- Risk categorization
- Reporting formats
- Tracking

Each project lead will manage the risks for his or her project. See Monitoring, Controlling, and reporting section, below.

Following are the best practices we will aim to implement in mitigating risks:

- No rush planning; bringing all stakeholders to the table and get their commitment
- Create proper governance and support structure
- Assemble a dedicated team
- Make sure team members know their roles
- Create test environment
- Deliver larger projects in phases
- Get clients to test and create or modify existing business processes
- Plan for a bumpy data migration
- Create service-level agreement with client
- Blitz support on go-live date
- Monitor systems for 60 days
- Celebrate success and acknowledge the team
- Procurement Management

A Procurement Management Plan will be created by the COO that will outline the following:

- Procurement policies and procedures;
- Risk Management issues;
- Contract Change Control systems;
- Payments systems;
- Claims administration;
- Performance reports;
- Payment systems.

The CEO and Governing Board will review all contracts, as will, when relevant, the CTO and Director of Community Engagement and Service Delivery. Outside legal counsel will be required for every contract, as there is no lawyer on staff.

The largest and most important contract will be with the Technology Partner (CTO), who will be responsible for developing the technology procurement plan, solicitations, equipment purchases, contracts with partners and vendors, hiring and managing technology team, make-or-buy analyses, systems integrations, activity costing and more.

Stakeholders

Stakeholders are individuals who are involved in the project, or whose interests may be positively or negatively affected as a result of the execution of the project.

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Stakeholder	Impact and Influence
Senior residents (age 65+)	This group is the target audience for the VillAGE Initiative. They have the most influence on all aspects of the project, and it impacts their lives the most. As a result of the Initiative, they will have more autonomy and be safer living at home and in community.
Families of senior residents	The people directly linked to the seniors are also extremely affected by the project and have a lot of influence on how it will unfold. They could gain tremendous peace of mind from the Initiative and also have their lives made easier if their loved ones are more autonomous.
Future seniors (age 40–64)	Those not quite senior yet will be able to reconsider their entire approach to aging in light of the VillAGE Initiative, and perhaps, with this increased awareness, use prevention to avoid negative outcomes in the future.
Participating residents	The notion of the VillAGE is to ideally have the entire community participate and help one another for mutual benefit thus strengthening the community as a whole. The impact of the group on the success of the project is important.
The City of Côte Saint-Luc	The City of Côte Saint-Luc, its residents, reputation, and demographics will be heavily impacted by the VillIAGE Initiative, which is game-changing for the municipality. The City itself will continue to have an extremely important and influential role in the project.
Technology Partner	This company and its president, who will be the VillAGE CTO, has a major influence on the project and all its outcomes. Its success depends on this partner.
Future Board members	This group will have significant influence on the direction of the VillAGE Initiative and will directly impact key decisions.
Future VillAGE staff	Those earning their livelihoods from the project will of course be impacted by it. They will have a major influence on its implementation and success, but also on the lives of the individuals who participate in it. Those who have worked on it so far have been transformed already, and will only be more so as they see it through.
Community partners	This group stands to benefit immensely from the VillAGE Initiative, and can co-develop programs and services with us. With social prescription and referrals, the project could even see their attendance numbers increase.
Research partners	The impact and influence of university research partners on the Initiative is already significant and will continue to be so. They have already helped shape the direction of the project, and will advise and co-create with us in the future as well.
Health and Social Services Centre	The strain of a rapidly aging population on these institutions is acute. The Initiative could have an immense benefit to and help alleviate the burden on the health system. The Initiative will complement rather than overlap with the services provided by these centres. Our partnership with them is highly valuable.
Hospitals	The hospital system is both a major beneficiary and major partner of the VillAGE Initiative. The project will improve the trajectories of care, and advance the objectives of the health care system, which is moving towards digital health and transferring care to where the patient is. The Initiative will also receive advice and expertise from this group.
Provincial government	The province has a major impact on this project in terms of support, funding, and direction. It will have a seat on the Board, and can, within its powers, shift the entire focus of health spending on prevention and programs such as this.

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Stakeholder	Impact and Influence
Service providers to seniors	Several kinds of people fall into this category, and they are those that will be more indirectly affected by the project. This group includes: pharmacists, taxi drivers, transit services, and gardeners, but also companies like Lifeline, security companies, etc.
City staff, especially those who work in the Library, Parks & Recreation, Public Safety (including EMS & vCOP)	Many in this group will be heavily impacted by the VillAGE Initiative, in that new programs, services, and standards will need to be created, adapted, or adopted by them.
Building operators	If the VillAGE Initiative is successful, building operators (including superintendents) may have a more significant role to play in the lives of their tenants. They can opt to install smart technologies, receive alerts, and also impact social activities in the building.
Senior residence operators	These operators will be both positively and negatively impacted by the VillAGE Initiative. People living in their homes longer means they don't move into these facilities, but on the positive side, they could make excellent partners for deploying technologies and augmenting their services.
Emergency Response Services (Ambulance, Fire, Police)	The Initiative will definitely have a positive impact on these services, because prevention is a major part of what it's about. They will be better able to do their jobs if we succeed.
MEDTEQ	This consortium will have definite impact on the project, especially in the realm of funding. With funding will come a measure of influence.
Tech companies who create tools	Any variety of businesses who develop technology tools for seniors could benefit from this project, especially those open to working with us. Some will see the Initiative as competition, but most could co-develop new products with us and test them with our target population.
Other cities	Other cities (nearby and not) can be both positively and negatively impacted by the VillAGE Initiative. The project may create expectations in their populations that they may not be able to meet, and if any responsibility for health is devolved to cities, it will definitely impact both their budgets and operations. Other cities also stand to gain from the project, as the knowledge and technologies will be openly shared with them.

Table 3-1: Stakeholder impact and influence

Communications

Project Communications Management involves the creation of a Communications Strategy, which will include:

- Stakeholder register
- Stakeholder communication requirements
- Stakeholder Management Strategy
- Information to be communicated (including language, format, content)
- Communications distribution channels (e.g. emails, press releases, social media)
- Communications technology
- Communication requirements analysis
- Communication models and methods

A Marketing and Communications Coordinator will be responsible for all VillAGE Initiative communications and the creation of the Plan. This person is linked to the CEO but reports to the Director of Public Affairs, Communications and IT in the City

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of Côte Saint-Luc. The reason for this structure is that the City is providing many in-kind donations related to marketing and communication, and so it made more sense to have a resource dedicated to the VillAGE Initiative on that team.

3.5 MONITORING, CONTROLLING & REPORTING STRATEGIES

Each project lead will manage their project scope, time, cost, quality, human resources, and risk management. This includes:

- Defining and sequencing activities
- Estimating the resources required
- Estimating the duration of each activity
- Developing and controlling a schedule
- Estimating costs
- Determining and monitoring a budget
- Performing quality assurance and quality control

Where the Management Team is designated as responsible in the GANTT chart, the CEO will ensure that the activity gets completed.

Issues may escalate in certain areas of our project plan. To address them, an 'issue log' will be instituted. The log will manage the status, level of importance or priority, provide a description of the issue, a resolution timeline, possible escalation and evaluate the impact it may have on a project or other dependencies as well as indicate who will be responsible for managing it. The log will be accessible and archived when completed on the VillAGE Intranet management system.

For the closure of each activity, 'lessons learned' documentation will be created, which includes variances, corrective actions taken and other relevant information.

The culture of the VillAGE Initiative as an organization must be one that accepts failure as a means of learning, without which innovation and best practices will not occur. As long as failures are acknowledged as they occur, discussed, documented, and corrected, the Initiative will move forward.

Project Reporting and Communication

We will provide regular reports and communications to various stakeholders and partners of the VillAGE Initiative such as monthly status updates, regular reviews, and as-needed communication to keep them informed.

Quality Assurance and Quality Control

To monitor and verify the effectiveness of processes used to manage and create the deliverables, we will be using a Quality Assurance software solution like TestRail. It is an easy to use web-based QA tool that integrates task lists and time tracking module solutions to organize test cases, execute tests, collect results, and coordinate testing efforts. TestRail also lets you automatically project past estimates and actual time spent into the future to predict workload more accurately. Project dashboards and email notifications keep you informed throughout your testing. All activities and test results are archived so that you always have a detailed history available for your reference. Each project manager with his team will be responsible for tracking and testing their activities for Quality Assurance.

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Chapter 3 PROJECT MANAGEMENT

3.6 KEY RISKS

Risks	Risk Mitigation Plan
Unavailability of human resources/skill gaps	• Get the right team by using resource allocation techniques and secure them when they are available
Achievement Requirements	• Clarifying requirements by holding workshops • Interviewing stakeholders • Producing a comprehensive scope document and project brief
Lack of communication between key stakeholders, project managers, customers	• Plan our communications and include all key stakeholders, managers and consumers
Schedule coordination	• Appoint a coordinator responsible for ensuring proper coordination of activities and their dependencies across the projects • As a secondary role, the coordinator will ensure project managers work collaboratively to improve efficiency and effectiveness
Delays in project start-up/execution	• Produce a development chart to measure delay and milestone slips of all projects to stay on track and on budget
No Plan B when Unforeseen Problems Happen	• Plan risk responses • Prepare an alternative plan which includes • Contingency fund • Additional resources on standby • Options to break the project into segments and/or reduce scope
Stakeholders disappointed	• Create Stakeholder register • Stakeholder communication requirements • Create a Stakeholder Management Strategy that sets the expectations from the very start.

Table 3-2: Risk mitigation plan

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Chapter 4 TECHNOLOGY

4. THE TIME IS NOW

We live at a time where older adults can benefit from technology that improves their quality of life at home and in community. This has been made possible by advances in smart devices, data science and system interoperability. This technology has reached a maturity where it can provide older adults with more confidence, convenience, safety, and social connectedness.

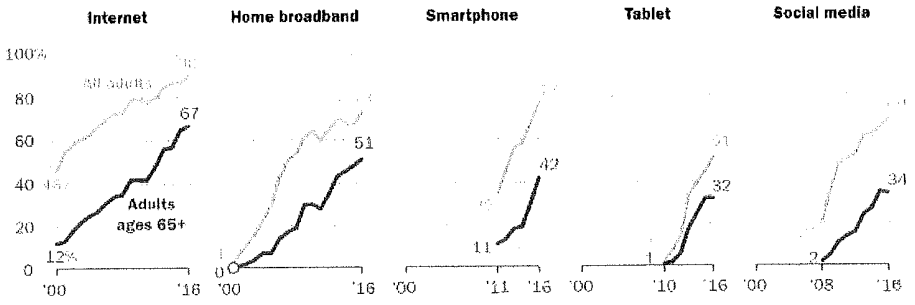
4.1 TECHNOLOGY ADOPTION AMONG OLDER ADULTS IS GROWING

Contrary to popular stereotypes, older adults are adopting technology at a growing and rapid rate. Recent Pew Research Center surveys[2] found that 42 percent of adults ages 65 and older own a smartphone—up from just 18 percent in 2013—and 67 percent use the Internet and home broadband—a 55-percentage-point increase in just under two decades (see figure 4-1).

4.2 A FAST-GROWING TECH SECTOR IN THE LONGEVITY ECONOMY

The Longevity Economy is expected to grow to more than $30 billion in the next few years[3]. Families, caregivers, and older adults will increasingly be acquiring new tech-enabled services that improve the quality of their lives. The 50+ market is increasingly aware of technology alternatives. The desire to live at home dominates the minds of the city-dwelling baby boomers who began turning 72 in January 2018. Health costs rise and health policy drives care into the home. Stark consumer economic realities prevent moves to senior housing and life expectancy at age 65 still substantial, especially for women.

There are four main categories of technology for aging in place (see figure 4-2). Each useful in itself—but together, they provide a complete, albeit complex puzzle for maintaining connections, safety, health, and a more fulfilling and interactive life as we age.



Source: Survey conducted Sept.29-Nov.6, 2016. Trend data are from previous Pew Research Center surveys.
"Tech Adoption Climbs Among Older Adults"

PEW RESEARCH CENTER

Figure 4-1: Charts showing smartphone, Internet, tablet, and social media adoption amount older adults.

[2] http://www.pewinternet.org/2017/05/17/tech-adoption-climbs-among-older-adults

[3] The 2018 Market Overview from Aging in Place Technology Watch https://www.ageinplacetech.com/files/aip/Market%20Overview%202018%20Final%2003-14-2018.pdf

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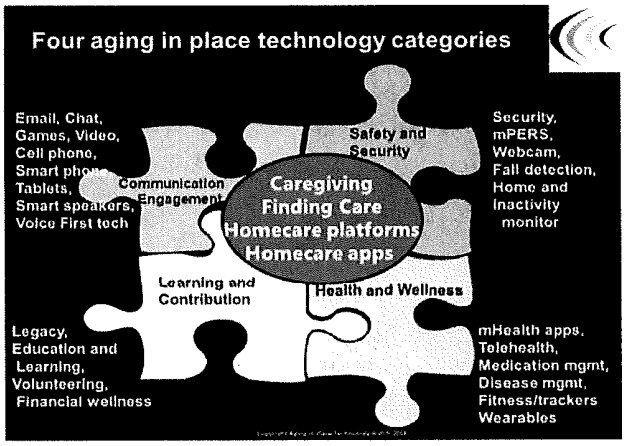
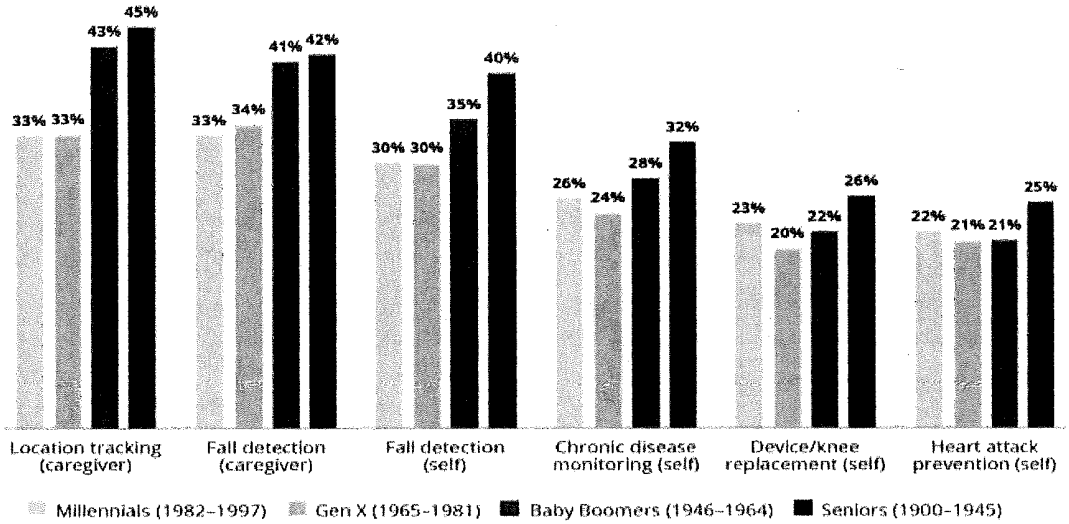


Figure 4-2: Aging in Place Technology Categories

The Personal Emergency Response Systems (PERS) market alone is expected to reach $3 billion in 2019[4]. PERS device firms include Nortek, MobileHelp Smart, and TruSense. Modified interface solutions for older adults are available from GreatCall (acquired by Best Buy) and GrandPad. Wearables, which include health-related sensors, began to take the stage in 2017 and early 2018, including UnaliWear, Clairvoyant Networks, and MyNotifi. Health and wellness solutions include Kardia Mobile for EKG, Misfit Vapor smartwatch for sleep tracking, and PillDrillHub, AdhereTech, and MediSafe for managing medications. Voice-first interfaces such the Alexa or Google Assistant provide hands-free in-home engagement. The CareCoach puppy and Hasbro's Companion Pets focus on providing companionship for and serving the elderly. These solutions represent a very small fraction of the overall fast-growing market.

We find it interesting that older adults and Baby Boomers are more likely to use sensors and other passive technologies than younger generations (see figure 4-3).

The number of technology vendors and solution options available is enormous, complex, and ever-evolving. It has become confusing to navigate for older adults, their families, and caregivers. The landscape is highly siloed, solution sets can be very costly, adoption is difficult, integration is challenging (if not impossible in most cases), and privacy issues present very legitimate concerns.



Source: Deloitte 2016 Survey of US Health Care Consumers.
Note: Chart shows respondents who are likely to use the technology, where "likely" is defined as answering "4" or "5" on a five-point scale in which "1" is "not at all likely" and 5 is "extremely likely."

Graphic: Deloitte University Press | DUPress.com

Figure 4-3: Bar chart illustrating use of six health technologies used by four generational segments.

[4] https://www.ageinplacetech.com/files/aip/Market%20Overview%202018%20Final%2003-14-2018.pdf

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4.3 THE FINALIST PHASE—ENGAGEMENT, RESEARCH, AND PILOT

During the finalist phase, we:

- consulted with residents during community engagement to discover their experiences, needs and concerns associated with technology
- researched and evaluated existing technologies and solutions
- implemented a pilot project in the homes of five residents (described in Chapter 6—Engagement)
- defined a vision and plans for our Connected Technology Framework—The VillAGE Platform

4.3.1 Requirements Derived from Community Engagement

We discovered a broad set of older adult resident needs during our community engagement initiatives (see Chapter 6 - Engagement). From a technology implementation perspective, we categorize these needs as follows:

- Tech for **convenience**, focused improving experiences with day-to-day tasks and addressing challenges associated with cognitive and physical decline.
- Tech for **safety**, addressing challenges associated falls, water overflow, air quality, etc.
- Tech for **social connectedness and engagement**, focused on facilitating community interactions using digital channels and addressing challenges with social isolation.

Through discussions with the community as well as with our university research partners, we discovered how critical it is for our project to deliver **core solutions that offer simple and convenient user experiences with device interactions that are highly-adapted to older adults** and their lifestyle, both **at home** and **on the go**. These could include the following:

- **Sensors** and other passive devices and technologies
- **Voice and conversational assistants** offering a dialog-based approach
- **Touch interfaces** such as tablets, smartphones, and wearables which are easy to use, intuitive to operate, and that cover a wide range of needs
- **Wearables**, such as smartwatches—which are preferred to pendants—that integrate nicely into daily living and that offer a wide range of features
- **Smart automation**, at home or on the go, providing assistance based on intelligent situational analysis (e.g., using data science, AI, etc.), device integration, configurable workflows triggering alerts, actions, responses
- **Seamless integrations** across devices and to the City, community, and partners

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4.3.2 Research and Evaluation of Existing Technology Solutions

We researched and evaluated a number of existing technology vendors and solutions during the finalist phase that might have fit our older adult residents' expressed needs, either as core or satellite solutions. The following table highlights many of the existing technology solutions we researched and evaluated.

Vendor/solution	Description
Essence Care@Home™ Enhanced Telecare Services Platform	An Aging-in-Place product suite that offers a seamless health monitoring experience, allowing independence for older adults and peace of mind to their loved ones. **https://www.essence-grp.com/smart-care**
InteliCare	Based on sensors, the InteliCare solution is designed to support people to remain in an independent living environment for longer, whether this be within their own home, a retirement village or in an aged care facility. **http://intelicare.com.au/**
Aerial	Aerial Technologies uses artificial intelligence to analyze disruptions in WiFi networks, extract data, and ultimately give meaning to motion (including fall detection), without requiring additional hardware, wearables or cameras. **https://www.aerial.ai/**
Elemental Core	A social prescription platform based in the UK offering Health Risk Analysis, Social Prescription Generation, Health Impact Measurement, Calendar, Attendance Tracking, Reports, Campaigns, and more. **https://elementalsoftware.co/platform/**
Laipac Look Watch	An elegant, standalone, and feature-rich IoT smartwatch for safety, health and wellness. **https://www.laipac.com/smartwatch.html**
Routinify WellAssist™	Tablet and IoT sensor-based solution providing for an environment of Adaptive Routines™ to create and reinforce positive habits with the goal of improving wellness, safety, social and mental engagement, and security. **https://www.routinify.com/**
ElliQ	An AI driven social companion robot aimed at keeping older adults sharp, connected and engaged. CES 2018 Best of Innovation Winner. **https://elliq.com**
Elizzbot	On-demand Smart Chatbot for Family Caregivers. **https://elizz.com/landing-page/elizzbot**
UBIOS	Smart building solution primarily focused on preventing water damage via sensors. **https://www.ubios.ai/**
Amazon Echo and Alexa	Smart speaker and voice-controlled intelligent personal assistant service by Amazon. **https://developer.amazon.com/alexa**

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Vendor/solution	Description
Apple Watch	Smartwatch by Apple Inc. It incorporates fitness tracking and health-oriented capabilities with integration with iOS and other Apple products and services. **https://www.apple.com/healthcare/apple-watch/**
Université de Sherbrooke DOMUS laboratory solution (DOMUS)	The Université de Sherbrooke DOMUS laboratory developed a smart home solution for older adults primarily based passive sensors and open technologies for research purposes. **https://www.usherbrooke.ca/domus/en/**

We considered and evaluated solutions according to our Technology Evaluation Criteria for The VillAGE Initiative, which is covered in the next section.

4.3.3 Technology Evaluation Criteria for The VillAGE Initiative

We have a responsibility to deliver simple, safe, private, and affordable solutions to our community. Given the high number of characteristics that any individual solution and vendor might have, and based on what we learned in community engagement combined with our market research, we developed our definition of **Technology Evaluation Criteria for The VillAGE Initiative:**

Category	Evaluation Criteria
Relevance	• Is the solution's feature and capability set relevant to older adults? • Was the solution developed for a broader population and, if so, does it fit older adults?
Readiness	• Where is the solution in the readiness and maturity lifecycle? • How much of it is ready to deploy? • Is the solution proven with real-world deployments?
Simplicity	• Is the solution simple and intuitive to use by older adults?
Adaptability	• Is the solution configurable to meet individual older adult needs? • Does is the solution extensible by outside parties to meet key older adult requirements?
Smartness	• Is the solution smart (if applicable), providing intelligent assistance to the user?
Privacy	• How does the solution manage private data? • Where does the vendor reside? • Where does data reside? • Is the data shared with partners? • Is the solution transparent enough for a third party to validate data management and flow?

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Category	Evaluation Criteria
Security	• Does the solution implement relevant best practices around security (authorization, encryption, etc.)?
Compliance	• Does the solution comply with applicable standards and certifications?
Interoperability	• Does the solution provide adequate and sufficient interfaces for interoperability with other systems (data integration, UI integration, etc.)? • Are there any limitations that would prevent the solution from being integrated with our partner ecosystem today or in the future (health-care, research, or other)?
Manageability	• Are heavy services needed to deploy and implement the solution? If so, what are the required skillsets and where could they be sourced from? • Is the solution itself difficult to implement and manage/monitor/maintain over time?
Replicability	• Are the any limitations (geographic or other) that would prevent the solution from being deployed to other cities?
Sustainability	• Does the vendor have strong financial backing? • How would the solution adapt to technological change?
Scalability	• Are there any limitations that would prevent the solution from scaling to thousands or even millions of users?
Affordability	• Is the solution affordable for older adults across varying income categories?

We evaluated the vendors and solutions using this criteria. We retained solutions that satisfactorily fit a sufficient number of our criteria and implemented them in our pilot project (described below). This included the DOMUS solution and the Laipac Look Watch. We added and integrated Amazon Echo to test voice assistance.

Our technology evaluation criteria would be used to vet solutions in our full program implementation of The VillAGE Initiative, giving our residents confidence that we are taking a holistic, safe, and efficient approach that has their best interests in mind.

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4.3.4 Our Pilot Project

In January 2019, we launched a 4-month pilot project with five older adult participants living in Côte Saint-Luc (details on our subjects are covered in Chapter 6—Engagement). We used technology solutions that sufficiently satisfied our above-mentioned Technology Evaluation Criteria for The VillAGE Initiative. The goals of our pilot project were to begin experiencing and testing the following:

- resident interviews for needs assessment
- at-home installation of technology
- resident acceptance of technology
- solution monitoring and results
- resident feedback

We implemented the following technology:

- The DOMUS smart home solution (from Université de Sherbrooke) with connected Amazon Echo (Alexa)
- The Laipac Look Watch

4.3.4.1 The DOMUS Smart Home Solution

Since 2002, the DOMUS (DOMotics at the Université de Sherbrooke) laboratory has been studying cognitive assistance, medical monitoring and televigilance for people with cognitive disorders. The results of the research performed at DOMUS are applicable to people with cognitive deficits due particularly to head trauma, schizophrenia, Alzheimer's disease and cognitive impairment.

Based on their extensive expertise with advanced cases of cognitive decline, DOMUS has developed over 16 years a standard approach for older adult research in Quebec. To support their work, they have developed a smart-home-for-older adults technology platform using **open technologies**. The technology largely consists of passive sensors that integrate well into an older adult's every-day living. The technology is mature and setup only takes a few hours per home, which in large part is why we selected it. Also, DOMUS is university research lab, which gave us the confidence that privacy and subject consent were being taken very seriously.

In the DOMUS solution, small passive sensors (e.g., motion, water, door, drawer, appliance, etc.) capture and send raw activity data to a small computing hub in the home. The hub analyzes it, understands it, makes decisions, and produces actions or responses. The hub also sends data to a configured server to record activity, assemble activity patterns, and integrate with external systems.

With the DOMUS solution, a bed pressure sensor could detect an older adult getting up at night and trigger a response, such as turning on the bedroom lights, which reduces the risk of injury. A water sensor in the bathroom would detect whether the faucet was turned on, and generate a reminder in case the older adult forgets to brush their teeth within a set time. These are just some of the many ways technology can used.

The DOMUS solution is based on open technologies, including openHAB as a controller for the home hub—typically running on a very low-cost Raspberry Pi. It also supports smart home data communication and interchange protocols and standards such as MQTT, ZigBee, Z-Wave, which makes the architecture very attractive from an interoperability, extensibility, transparency, privacy, and affordability perspectives.

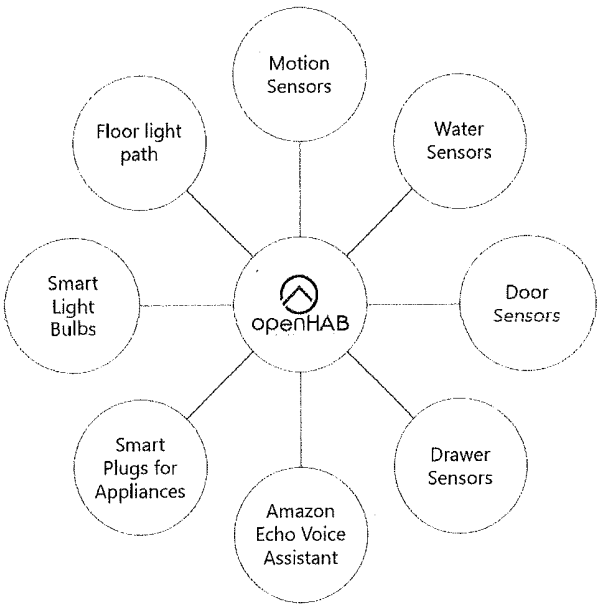


Figure 4-4: Chart showing eight examples of sensors or smart technology that connected with the openHAB-based home hub during our pilot.

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During our pilot project, we installed low-cost motions sensors (Fibaro), water sensors, door and drawer sensors (Fibaro), smart plugs for appliances (Aeon Labs), smart lightbulbs (Philips Hue), and a floor light path (Philips Hue). We also installed one Amazon Echo unit per home to enable participants to use voice commands to operate lights (e.g., "Alexa, Lights On") and to access information and entertainment, such as news, weather, and music.



Figure 4-5: Photos of the smart device installation in a pilot particiant's home.

The DOMUS solution experiment also gave us a chance to experience the benefits of Augmented Reality (AR). Using Microsoft HoloLens—which is a virtual reality (VR) headset with transparent lenses for an augmented reality—we were able to capture and generate the map of a home or apartment that includes placement of and activity from smart devices. The approach offers great capabilities for remote monitoring and troubleshooting.



Figure 4-6: Photos of the HoloLens capture and generated map of pilot participant's home.

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4.3.4.2 Laipac Look Watch

In addition to the DOMUS smart home solution, we also implemented the Laipac Look Watch, which is an esthetically-pleasing, full-featured Android-based IoT smartwatch. Core features for older adults include tracking and monitoring, geofencing entry and exit alerts, heart rate monitoring, fall detection, SOS button, check-in feature, watch removal alert, two-way voice communication, and more.

We configured and trained pilot participants on how to use the watch. In the event of a fall or after manually pressing the SOS button, the watch would automatically alert family members, friends, or project volunteers. We used the Look Watch's backend software to deploy configurations (e.g, contacts, reminders, etc.) and track pilot participant activity, including any detected incidents.

4.3.4.3 Pilot Project Results

Our pilot project is scheduled to run until May 1, 2019. At the time of this writing, we are able to report results based on two months of activity in collaboration with our research partners. On an aggregate basis (to protect privacy), our pilot system generated activity reports for us and pilot participants to learn from. See Appendix for activity reports from the pilot project.







Figure 4-8: Photos of Laipac Look Watch used by pilot participant.

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4.4 THE VILLAGE PLATFORM

We learned a lot from our community engagement, market research, pilot project, and collaboration with partners. These learnings have led to the development of the vision and architecture for our Connected Technology Framework—**The VillAGE Platform**. This will help us meet the objective stated in our Challenge Statement.

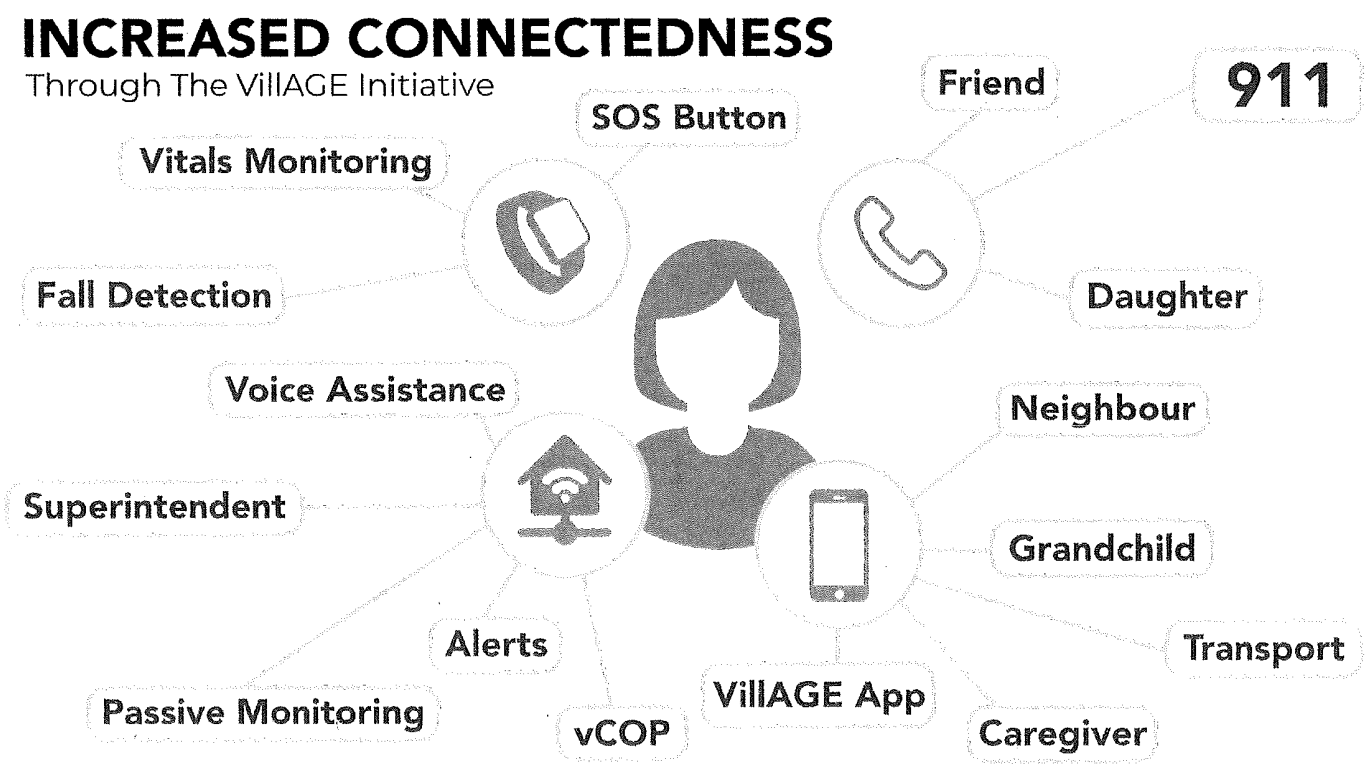


Figure 4-9: Graphic illustrating how the VillAGE Initiative will increase opportunities for connectedness for older adults.

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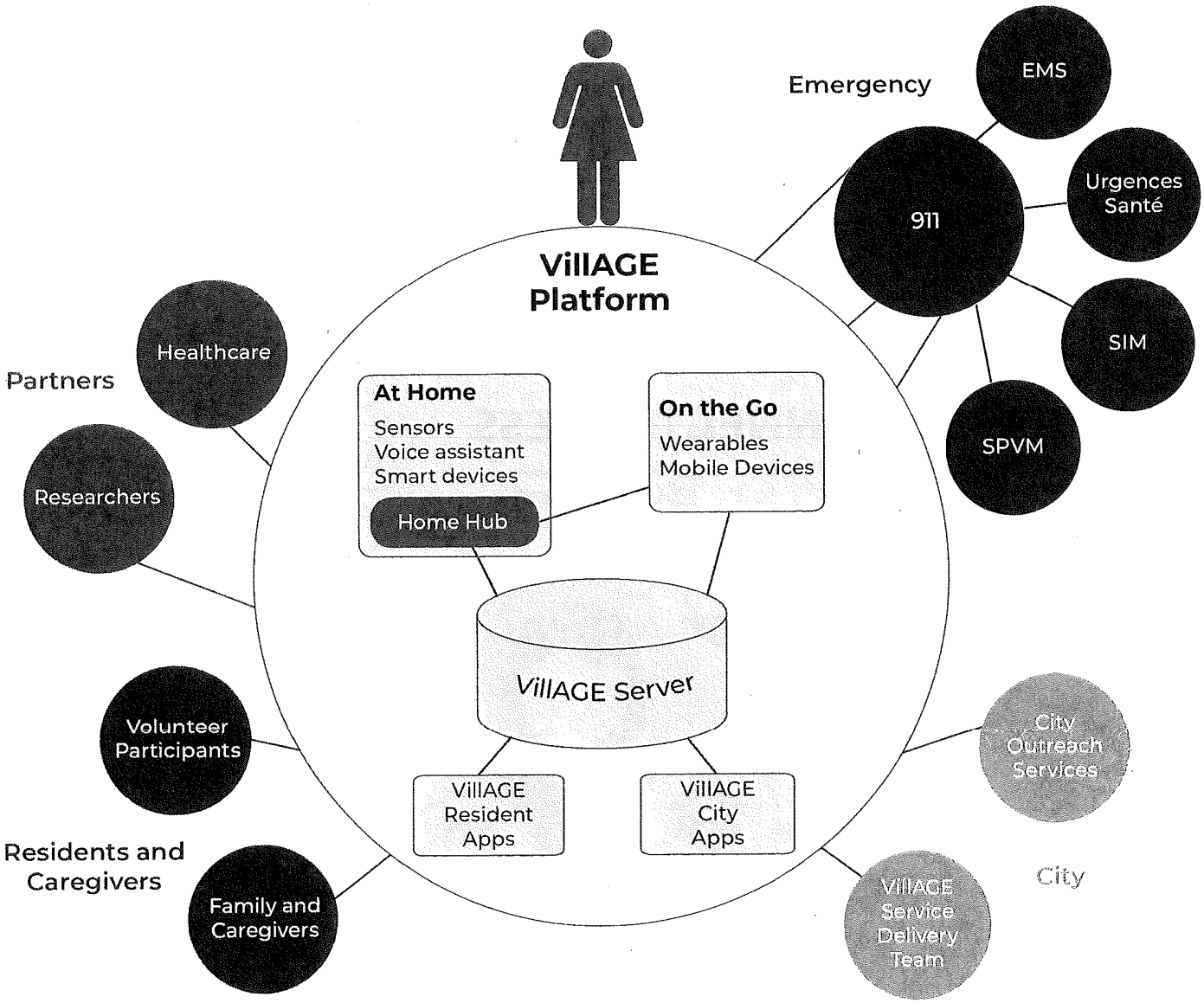


Figure 4-10: The diagram describes the flow of data emanating from alerts generated by the Home Hub and On-the-Go smart devices. Alerts will be transmitted to designated individuals (e.g., family, caregivers, according to the participant's instructions) and/or City services. In the case of an emergency incident, alerts would be sent to 9-1-1 and related services, as well as to residents and caregivers according to the participant's instructions. In the case of soft alerts, the information will flow to the VillAGE Home Hub and VillAGE Server, City Outreach Services and Service Delivery teams. Information would be provided to healthcare and research Partners in accordance with participants' consent.

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With a focus on providing more convenience, safety, and social engagement, the VillAGE Platform will allow older adult residents to access resources for help when they need them. The following table illustrates examples.

Category	Scenarios
Convenience	• A bed pressure sensor could detect an older adult getting up at night, and turn bedroom lights on automatically, reducing the risk of injury. • An older adult could use a voice assistant to get information on the news, weather, or social programming from the city on any given day.
Safety	• An older adult could experience a fall. A smart device could detect the incident, and trigger an alert to city services or even better, to someone who might be physically closest in the moment, helping with a faster response. • An older adult could leave the stove on. A level of response could be anything from a device that automatically shuts it off, to a call to check in on the situation, making sure the resident and those around her safe and sound.
Social Connectedness and Engagement	• An older adult could receive reminders while at home of upcoming activities at the library or local theatre, and a lift could be arranged. • An older adult might need help with a challenging task, such as salting a walkway. The older adult could broadcast the request using a voice assistant and a nearby neighbour who is connected using the VillAGE App, could receive and fulfill the request.

4.4.1 Platform Architecture

Our guiding architectural principles for The VillAGE Platform are the following:

- Open technologies
  - Core system based on open technologies, favouring transparency, extensibility, future-proofing, affordability, and replicability
  - Large developer community, reducing the risk of being short on resources
- Great experiences at home at on the go
  - Easy-to-use technology solutions wherever the resident is that add value to an older adult's daily living, connected to applications for the community and city
- Smart automation
  - Intelligence to assess situations
  - Smart, configurable automation and workflows to process actions and responses
- Interoperability
  - Seamless interoperability and integrations between devices, the city, and partner systems (based on consent)
- Privacy and security
  - Seamless interoperability and integrations between devices, the city, and partner systems (based on consent)

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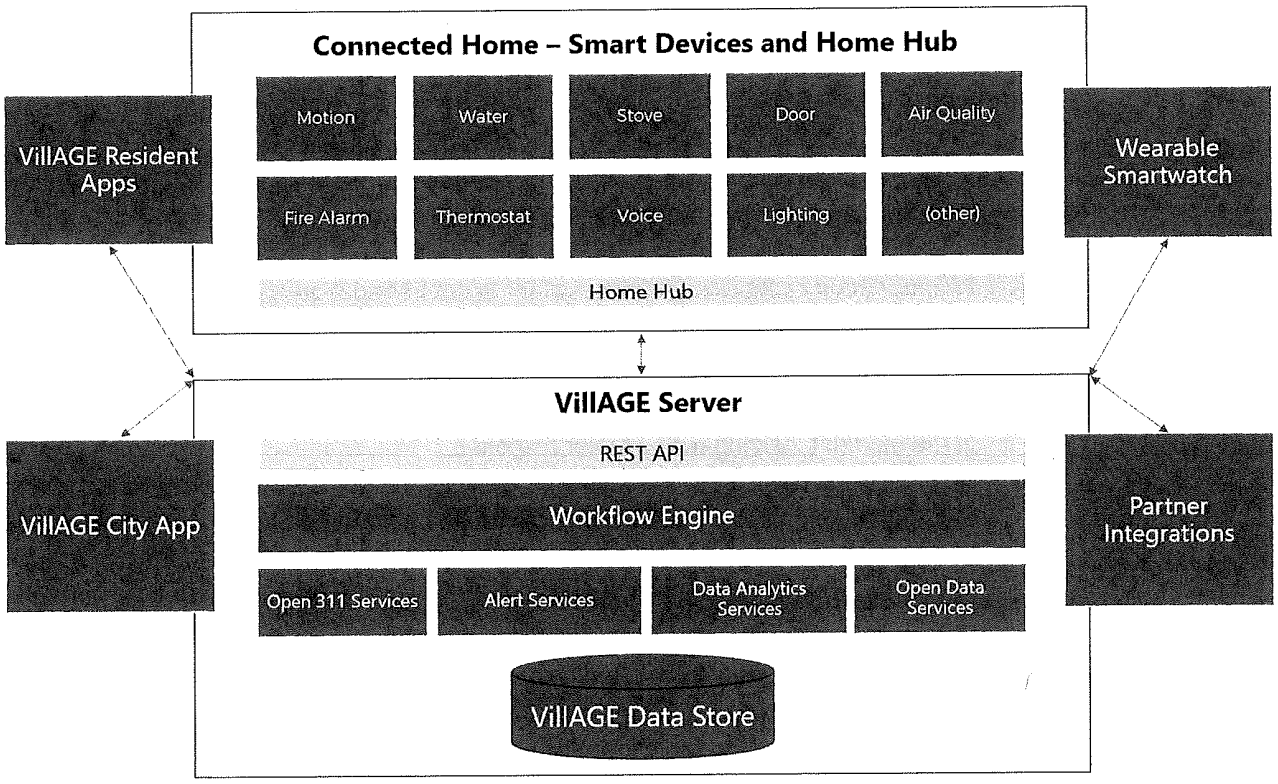


Figure 4-11: Illustration of the VillAGE Platform Architecture.

4.4.1.2 Connected Home—Smart Devices and Home Hub

Similar to what we implemented in our pilot project, various sensors and smart home devices would connect to the Home Hub for events, such as motion detection, water detection, voice commands, or others. These events would be **tracked, understood, processed**, and made to **trigger actions or responses**.

The Home Hub will be based on openHab, a mature, open-source home automation platform that runs on a variety of hardware and is protocol-agnostic. This means it can connect to nearly any home automation hardware on the market today.

The Home Hub will integrate with devices using a wide range of protocol bindings supported by openHab, including but not limited to MQTT, ZigBee, and Z-Wave. The Home Hub will also include or integrate with a reasoning or decision-making engine, which will be based on simple decision trees, ontological rules (OWL), and/or more advanced data science- or AI-based framework such as TensorFlow, which is an open source machine learning framework, based on requirements for "direct vs nuanced" interpretations of device activity and response requirements. The Home Hub would send information, based on resident consent, to the VillAGE server for processing, recording, and integrations outside the home.

Given reported privacy issues with popular voice assistants such as Amazon Alexa and Google Home, we would consider implementing an open technology-based solution using Mycroft or Snips.

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4.4.1.3 Wearable Smartwatch

We will continue our work with Laipac on their leading-edge Android-based Look Watch to develop it further for older adults and to integrate its core capabilities for older adults (e.g, vitals monitoring, GPS positioning, fall detection, two-way voice calls, etc.) into the VillAGE Platform.

4.4.1.4 VillAGE Resident Apps

We will implement an older adult-adapted smart home controller app, **The VillAGE Home Hub Panel App**. Based on HABPanel, openHab's open-source user interface software will allow residents to be able to interact with and monitor their smart home devices using **a single touch interface for all VillAGE devices** installed in the home. Based on open technology, non-VillAGE devices (such as a smart TV) could be added to the Hub Panel App as well. The panel solution could be fixed on a wall or could be used on a mobile device, depending on the preference of the older adult.

We will also develop **The VillAGE Community App**, a simple-to-use app for residents, families, and caregivers. This mobile app will allow them to stay connected to the older adults they care for. The VillAGE Community App will allow people to "subscribe to" or "follow" events and requests from specific older adults in the community. For example, a volunteer might request to be notified if her older adult neighbour in an apartment two floors down has fallen or needs help with a task.

The VillAGE Home Hub Panel App and The VillAGE Community App will include Jitsi, an open source videoconferencing solution. This will facilitate live discussions with other community members. We are also considering **Rasa**, an open source conversational AI platform.

4.4.1.5 VillAGE City Apps, Workflow Engine, and VillAGE Data Store

City Outreach and Service Delivery teams will use the **VillAGE City App**, an enterprise application that will manage all backend functions such as:

- Older adult resident registration, profile, and contact management
- Case management
- Device order tracking and system configuration
- Monitoring and service calls

The platform will also include a **Workflow Engine** for server-side processing of older adult activity to produce responses (such as alerts to the right parties).

We will develop the VillAGE City App and Workflow Engine with JOGET, which is an open-source workflow software, business process management and low-code application platform. Among other database engines, JOGET supports MySQL, an open source database we will use for the **VillAGE Data Store**.

4.4.1.6 REST API

The **VillAGE Server** will be accessible via a **REST API**, which will be implemented using an open framework such as Node.js, that will cover the totality of our backend services. Together with our JOGET-based workflow engine—which itself generates REST APIs—this will make our system highly interoperable.

4.4.1.7 Open311 Services

Open311 systems are used in many cities including Ottawa and Toronto for a wide range of city services including alerting city workers to problems with garbage collection, illegal parking, and vandalism. We will instead use the same concept to trigger emergency services, in-home visits, check-in phone calls, and other interventions.

Open311 Services is our extension to Open311, which is protocol that advertises what services are available and what data is needed to access those services. It is very easy to connect with any mobile device or networked system. It typically identifies who is requesting a service and where they are located using GPS or other geospatial data.

Our system will leverage JOGET to create an Open 311 system. Open311 SDK is a REST API standard that has been used throughout Europe and parts of the US to integrate smart city services with a building-block approach.

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4.4.1.8 Open Data

Our process model is clearly defined and will be shared openly with the city so that the process is clear and verifiable. Any metrics and KPIs of the project that are not of a private nature will be shared on a VillAGE dashboard that citizens can use to see summaries of data. Wherever possible, raw data will be available as open data, provided that the sharing of that data constitutes no breach of privacy of any individual or organization.

The nature of our system is to analyze individual needs of older adults, which results in private data. We then prescribe solutions to their specific issues and problems to help them link city, volunteer, family and private services, the services of each, which we clearly explain to each participant. We then use sensors, and IoT devices to establish a custom solution for the individual and set up data monitoring, which is completely private.

While the private nature of the raw data permits us only to publish data that has been anonymized and analyzed, the analytic results shall be open in every regard as long as no person can be recognized by that data or have their privacy violated. Role-based access to the data ensures that all databases have field-level access only to data for which the role is allowed access.

4.4.2 Replicability and Scalability

Our system is entirely comprised of technologies that are open source, with inexpensive off-the-shelf devices, capable of being run securely on inexpensive hardware with high security.

The most cost-efficient way to create this system is to divide it into two parts—the Smart Home and the Backend Server and address each separately.

4.4.2.1 Smart Home Solution Replicability and Scalability

The Smart Home can be assembled with three components: a Raspberry Pi running OpenHab as the hub, a Z-Wave Gateway USB stick, and a variety of off-the-shelf sensors and actuators. We listed the devices used in our pilot project. Regardless of the supplier, this basic home system will work as the majority of IoT suppliers support either Z-Wave and Zigbee protocols.

The number of devices one standard openHAB hub can support is in the hundreds, so it is possible to use one hub to support a WiFi-equipped apartment building assuming that the building shares the WiFi throughout and that the system has been tested for Z-Wave range. Typically, Z-Wave gateways need to be within 100 meters of the devices they control.

4.4.2.2 Backend Server Replicability and Scalability

For the backend systems, a standard cluster of high availability virtual machines, behind a high-quality intrusion protection firewall is the most typical route we expect cities would take. A cluster could consist simply of a VM Host, two VMs running either Windows or Linux, a DNS/load balancer and a good firewall.

For a large city, the number of front-end servers and application servers could be increased, using SAN arrays between the virtual machines, and a complementary disaster recovery array to mirror the online systems. A low-cost Linux approach we researched was Antle, which supplies a single box that can run up to 100 Linux Virtual Machines, rendering the deployment of backend services a simple, easy to maintain that any city should be able to afford at under $2,000 CAD.

4.4.3 Interoperability between the technologies, other technologies, existing community systems and services, and infrastructure

Our system's purpose is all about interoperability with existing systems and community services. The JOGET workflow system will link older adult needs directly to city services, while maintaining compatibility with Open311 systems. It will offer cities the potential to trigger city services based on any identified situation where one or more sensors is used to identify a situation. It may also be

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used in unique ways to accomplish other smart city monitoring services that go beyond the domain of older adults aging in community.

For example, a unique way to configure our system would be to link it to multiple air quality sensors and urban noise level sensors monitored by the artificial intelligence in the domain model to send out alerts to city workers and departments operating in specific sectors of the city. As our technology is based on standard protocols and configured with many options, there is no reason our system could not interoperate with any city system using standard protocols.

4.4.4 Accessibility and usability of the technologies to diverse users, residents, and other stakeholders that support their uptake and acceptance

The systems we apply to a specific older adult's home are geared for accessibility that is specific to each older adult. The majority of the system is designed from day one to be as passive as possible and not require any specific actions from a older adult, though elements such as voice-enabled assistance devices would require interaction.

Any interactive device must be chosen for its ability to match the cognitive abilities of the older adult, and over time it is possible that with cognitive decline, a device or interface used today may become unsuitable in the future. The monitoring of that older adult should help us be able to identify when gradual cognitive decline has hit a limit.

Wearable devices must be chosen for their compatibility with our criteria and standards, and at minimum, be able to send messages via MQTT or REST API via a supported communication channel, such as WiFi.

4.4.5.1 How the technologies comply with relevant legislative and regulatory requirements

The VillAGE Platform will maintain all records on the system in a HIPAA-compliant anonymized format. While the workflow system may require direct knowledge of older adult addresses and personal contact information, no other aspect of the system maintains information that would compromise older adult privacy.

The openHAB hub is an appliance that operates in their home, maintaining their sensor data in a private manner, which is connected to VillAGE servers via SSL. Operators may access an openHAB device using a secure VPN connection, but only under the direction of the occupant.

As the Workflow Engine is the main system that contains contact information, it is maintained behind a secure firewall with only the Open311 connections public-facing.

We will work with Laipac on data flow from the Look Watch to comply with our privacy practices and storage requirements.

The secure data management policies of the city and those outlined in the Preliminary Privacy Impact Assessment (PPIA) highlights the efforts taken to ensure that data is appropriately managed at all phases of collection, storage, and destruction.

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4.5 ROLES AND RESPONSIBILITIES OF PARTNERS

Under the leadership of our organization's CTO for the project, the partners who will collaborate to implement the VillAGE Platform are:

Partner	Role and responsibilities
Delevante Software	Delevante Software's expertise is in developing cross-platform technology solutions for local communities based on open technologies. Delevante's role will be to lead and implement the platform development.
DOMUS	DOMUS as a research-focused organization will advise on key technology-focused portions of the development.
Concordia University	Concordia as a research-focused organization, which includes the older adult-focused ACT (Aging, Communications, and Technology) project, will advise on the development.
Laipac	Laipac will be responsible the development of the smartwatch solution for the platform.
CIUSSS West-Central	The CIUSSS W-C, as our local healthcare network and partner, will act as an advisor around privacy, technologies for digital health, and interoperability with healthcare systems.

4.6 RISKS AND MITIGATION

There are four key cybersecurity risk points in the design of our system. All best practices for disaster recovery, high availability, cybersecurity, privacy and open data will be implemented.

Risk	Mitigation
Home Hub breach	The first risk is the ability for a malicious party to take control over one or more openHAB hubs. If a party were to infiltrate the WiFi connections of a older adult they could attempt to break into the openHAB hub. To minimize this risk, the administrative accounts of the openHAB server have usernames and passwords that are administered offsite, so that the device can only be accessed by accredited VillAGE system administrators using VPN connections to the older adults WiFi. In general, throughout our system, information on the usernames, passwords, VPN connections and other security information should be stored in a secure password server such as KeePass or Linux password vault and only accessed by VillAGE system administrators and configuration teams.
Access to raw and logged data	The second risk is the security of the raw data and situational data logs. While this data is by definition anonymous, it has value to the city and information within it could be triangulated with public information to constitute a theft of personal information. For these purposes, data is kept in encrypted databases. Access credentials to the databases is kept in encrypted formats and software which connects to the data uses o-Auth or Apache Shiro. Apache Shiro is a powerful and easy-to-use Java security framework that performs authentication, authorization, cryptography, and session management. With Shiro's easy-to-understand API, you can quickly and easily secure any application—from the smallest mobile applications to the largest web and enterprise applications.

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Risk	Mitigation
Server breach	The third risk is in the server system, which maintains confidential information about each older adult. This system integrates with a database that holds all survey and private information as well as location, address and contact information. This information is not available to the public. It is protected behind our firewall and uses role-based access to the system. The last cybersecurity risk is denial of service attacks, which unfortunately are becoming more prevalent. The most catastrophic would be access to confidential data on individuals in the program, which would be stored in city databases. As a primary policy, at no time will access to older adult data in the server system be accessible to non-VillAGE approved workers nor available outside our Intranet. The system prevents denial of service attacks through the use of FortiGate firewalls supporting FortiDDOS, which provides Layer 3, 4 and 5 DDOS attack prevention at high speed. CloudFlare is an alternate moderate cost solution that other cities might prefer since they require very little administration.
System downtime and lack of availability	As the number of deployments in homes increases, the overall system available will become a matter of concern. For this reason a high-availability model for the backend servers is key. Virtual machines with a shared SAN (Storage Area Network) are the preferred architecture for ease of administration. Depending on the needs of each city, they may choose from a wide array of virtual hosting and SAN hardware to achieve this. Using load-balancers between clustered machines generally keeps services running at high speed at all times while allowing for virtual machines to be shut down for maintenance without affecting the service provision. For optimal disaster recovery, a second data site that replicates the main system is preferred. On Windows servers, the use of DFS replication (distributed file system) and SQL mirroring will allow multiple virtual machines running Windows Server 2018 to run all required servers in a high availability mode with a load balancer administering the cluster. On Linux servers, following the advice on the Linux-HA project that is most appropriate to selected hardware is advised.

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Chapter 5 GOVERNANCE

The VillAGE Initiative requires an extremely strong governance model for its success and sustainability, and one which puts the right players in the right places at the right time. True to its name, it will take a village of partners and stakeholders to ensure the viability of the project. The Governance Chapter is based around the Organizational Model presented in Chapter 1 (see Figure 1-1). A non-profit organization will be created, which will be governed by a Board and run by a team of senior staff.

There are two main domains around which the VillAGE Initiative runs: Technology and Social Transformation. While separate, these two domains collaborate closely. Both are fueled by ongoing community engagement with a design-thinking mindset, and service will be delivered in conjunction with a multitude of partners. The technology side is going to be run by a private partner with expertise in the domain, and the social side will be led by a person from the City of Côte Saint-Luc.

5.1 GOVERNANCE FRAMEWORK

In order to maximize sustainability and effectively deal with all the governance challenges, the City of Côte Saint-Luc proposes the establishment of a federal non-profit organization (NPO) under the *Canada Not-for-profit Corporations Act*. It would:

- Define, within its articles of Incorporation and its by-laws the various classes of 'members';
- Define the Board size and composition;
- Define members' respective roles, terms, rights, delegations, accountability, limitations and obligations;
- Create a clear and concise mission statement and strategic plan that will be its guiding force;
- Establish a policy framework and operational structure for developing, implementing, reviewing and maintaining the VillAGE policies and procedures in a form and manner that is consistent with best practice;
- Create governance and management policies;
- Stipulate other criteria that would facilitate funding, stability, growth, flexibility, research, and investment;
- Adopt a policy for data governance and information privacy protection;
- Create a risk management framework which will have a commitment to building a risk management culture in which risks and opportunities are identified and managed effectively;
- Create a legal compliance framework and an accountability framework;
- Establish the controlled entities (partnerships).

Establishing the NPO will enable the VillAGE Initiative to maximize the strengths of the government, business, and non-profit sectors, while minimizing the obstacles and drawbacks that each presents on their own. When constituting the NPO, the vision and the mission of the VillAGE Initiative will be outlined. The vision must entail a connection between government innovators and the technological and design community, and the governance must address the framework of that connection, which will be led by its Governing Board, management staff and private partners. The direct responsibility for the VillAGE Initiative needs to be shifted from the City Council to a NPO Governing Board for several reasons:

- Avoids political interference resulting from the electoral cycle;
- Allows information flow and data governance to be totally segregated from other City information systems and therefore ensures more privacy and controls;
- Allows for multidisciplinary Governing Board composed of variety of members with wide range of expertise who have wealth of knowledge and experience to guide the VillAGE Initiative;
- The VillAGE Initiative is too large to become

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merely a city department. Its scope is to such a scale as to require full attention by a team of people dedicated to it;

- Non-profit organizations are eligible to apply for a variety of grants that municipalities are not;
- A non-profit organization has more freedom and flexibility in terms of procurement and labour relations than municipalities;
- Research and development, particularly in the domain of technology, is far from municipal expertise.

The City, however, has the benefit of public trust and proximity to the population and also has the obligation and duty to comply with all rules governing access to information and privacy protection. The City also creates by-laws, is responsible for the public domain, zoning, and infrastructure, in addition to maintaining important programs and services that are crucial to the success of the VillAGE Initiative. It is for these reasons that long-term safeguards must be put in place to ensure that the City will maintain some governing control of the NPO, and include clauses in its founding statutes that indicate the following:

- That two members of the Governing Board must be sitting members of the Côte Saint-Luc City Council, and that those seats must be preserved in perpetuity;
- That the budget must be approved by the City of Côte Saint-Luc.

As a result, the new organization will be recognized as a "public body" for the purposes of privacy protection and access to information in accordance with the *Quebec Act respecting Access to documents held by public bodies and the Protection of personal information* and among other duties it will have all the obligations and rights to protect the data, which will be generated by this Initiative.

Governing Board

The Governing Board will be made up of nine independent members with a diverse range of expertise, perspectives and knowledge who have a fiduciary obligation to oversee and ensure that they are in the role to continually assess a variety of risks regarding all elements, including but not limited to: financial reporting, ethics, privacy, technology, health and safety. The Governing Board will be accountable for the oversight of the governance process. It will include the following members:

- 2 sitting members of the Côte Saint-Luc City Council
- 1 Medical/Social
- 1 Research/Academic
- 1 Technology Entrepreneur
- 1 Venture Capitalist
- 1 Resident
- 1 Provincial Representative
- 1 Lawyer/Privacy expert

5.2 MANAGEMENT

The following positions constitute the Management Team.

The NPO will be run by a **Chief Executive Officer (CEO)** who is also responsible for the Social Transformation domain of the VillAGE Initiative. The CEO reports to the Governing Board, and is the primary link with the Technology Partner (see below), the City of Côte Saint-Luc, all other (non-tech) partners, and the Infrastructure Canada Smart Cities Challenge team. This person is responsible for the leadership and strategic direction of the NPO, its policies, development, marketing, and communications. On the Social Transformation side, this person will innovate and design municipal strategies that enable older adults to thrive, and work with the City of Côte Saint-Luc City Council and staff in order for them to incorporate these ideas and concepts.

A **Chief Financial and Operations Officer (CFO)** will run the organization, its administration, finances, legal and human resources, and fundraising, ensuring a lean management approach. This person develops procedures, implements policies, and ensures that Key Performance Indicators (KPIs) are met. The CFO reports to the CEO.

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A **Director of Community Engagement and Service Delivery** will be responsible for community engagement work and the service delivery design and team. This person will pivot between the technology and social transformation domains, ensuring that the technology is suitable and relevant to the users. The Director will also be responsible for tracking, analyzing, and reporting on outputs and outcomes, and ensuring the quality of the services provided by the VillAGE Initiative is high and that all of its users maintain their dignity, their information privacy, and are respected as the elders of our society. The Director of Community Engagement and Service Delivery reports to the CEO.

The Management Team will be collectively responsible for:

- Providing and implementing the policies and procedures through which governance occurs within the organization;
- Optimizing the efficiency and effectiveness of the organization;
- Ensuring that the VillAGE Initiative follows all relevant laws and adheres to a high ethical standard;
- Ensuring that the Technology Partner adheres to all the rules and regulations related to governance, privacy, and sustainability and that it strictly fulfills its contractual obligations;
- Continually engaging in risk assessment and mitigation;
- Working towards ensuring that the VillAGE Initiative is sustainable and ultimately, transferable;
- Ensuring that the VillAGE Initiative is a fair employer that supports its diverse staff and allows them to thrive as individuals and as part of a team in an atmosphere of respect and professionalism;
- Ensuring that all staff, partners, and anyone else connected to the VillAGE Initiative hold true to its mission;
- Gathering data and reporting on all activities on a regular basis to the Governing Board, Infrastructure Canada, and all other parties outlined in the founding charter;
- Data Governance and Information Privacy Protection.

5.3 PARTNERS

The ultimate success of the VillAGE Initiative extends far beyond the NPO. An entire ecosystem of partners, including all levels of government, the research, health and private sectors, community groups, and citizens will collaborate to address the complex and widespread challenges our society faces related to aging.

5.3.1 The Technology Partner

The Technology Partner is the primary partner for the VillAGE Initiative, one essential to its existence. In the Organization Model (see Figure 1-1), the entire technology domain will be provided by a private company, consisting of a consultant who will serve as the Chief Technology Officer (CTO) and his full tech team, in order to develop the platform and do all the research and development, working with partners on the technology side. This company will be the same one with whom the City of Côte Saint-Luc contracted to help create and manage the Final Proposal project, and who was instrumental in developing the VillAGE Initiative.

The decision to contract out the technology portion of the VillAGE Initiative was based on the following:

- For-profit companies are run in an agile way, and are able to be extremely flexible.
- Private companies are eligible to receive R&D tax credits from other levels of government.
- The size of the technology team required to create the VillAGE platform is larger than what the budget allows and the size of the team required will fluctuate. The NPO will not have to allocate resources to manage them.

Delevante has more than 15 years of experience and expertise building large-scale technology solutions across a wide range of sectors including: aerospace, investment finance, pharma, healthcare, energy, entertainment, social media, and retail. Today, Delevante's focus, expertise, and pas-

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sion are in building modern technology platforms, based on open technologies, that drive engagement and commerce for local communities, which is philosophically aligned with Côte Saint-Luc's and the VillAGE Initiative's objectives. Delevante is the creator of the leading-edge mobile-first platform Numnu, a smart connected platform that allows consumers to discover events (festivals, fairs, and more) in their area, engage on-site, place mobile orders, and promote local vendors and products to their networks. Founder and CEO of Delevante is Marc Chriqui, former president of Raymark, a leading global enterprise retail software vendor strategically acquired by US-based Mi9 Retail in 2015. Marc personally and very closely collaborated with Côte Saint-Luc during the Smart Cities Challenge finalist phase as Project Director. Concepts from Marc's expertise around smart and connected retail stores translated well and informed our designs for smart connected solutions for residents' homes and mobile devices.

5.3.2 City Partner

We outlined the special relationship that the VillAGE Initiative has with the City in the Governance Framework section of this chapter. Further information needs to be added, however, as the Initiative has a special and symbiotic relationship with the City. So important is this initiative to the residents of Côte Saint-Luc that the City is providing many in-kind donations, of space, resources, and services, especially in the first few years. The residents will need to have the comfort that the City is still behind the Initiative, even if it is not directly running it. This will be achieved through several means:

- City staff familiar to residents will have key and public roles in this Initiative;
- Community engagement will be done in conjunction with the City, in city spaces;
- Many services offered by the VillAGE Initiative, such as technology education and training for older adults, will be given by the City;
- Important activities, such as making Côte Saint-Luc an officially Age-Friendly Community will be done collaboratively;
- City departments such as the Library, Parks and Recreation, and Public Safety will co-develop programs and service with the Initiative;
- The *Programme d'adaptation de domicile* (PAD) program will continue to be administered through the City, and lobbying to modify it to include technology will be done by the municipality as well;
- Cross-promotion will occur continuously;
- The City will collaborate with all VillAGE research partners as a 'Living Lab'.

5.3.3 Other Partners

The VillAGE Initiative has, as part of its organizational model, relationships with research partners in both the technology and social domains. The goal is to continue working with valued partners to fulfill the vision set out in this proposal, and also to co-create with them and expand knowledge that will benefit society. See Appendix for the letters of support from our partners, which outline the nature of future collaboration. Our partners include the following:

RESEARCH PARTNERS

The VillAGE Initiative has, as part of its organizational model, relationships with research partners in both the technology and social domains. The goal is to continue working with valued partners to fulfill the vision set out in this proposal, and also to co-create with them and expand knowledge that will benefit society. Our partners have provided letters of support, which outline the nature of future collaboration.

Université de Montréal/Institut Universitaire de Gériatrie de Montréal: Our existing collaborators who have accompanied us so far in the community engagement and pilot projects, are committed to work with us to co-develop solutions and measure their social, human, and economic impacts. They will continue to provide the VillAGE Initiative with their expertise, time and resources in order to implement and measure performance outcomes for research and future development of smart solutions for older adults. They will also help secure funding and help develop an implementa-

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tion guide so that other cities may benefit from the VillAGE Initiative.

« Cette co-construction ardemment souhaitée par la Ville, et l'écosystème créé autour du projet, m'amènent à considérer la Ville comme un véritable laboratoire vivant; une infrastructure sociale et communautaire qui permettra l'émergence d'innovations par et pour les residents. »

—**Nathalie Bier**, erg., PhD. Professeure agrégée, École de réadaptation, Faculté de médecine, Université de Montréal

Université de Sherbrooke/Laboratoire DOMUS: This is a university research lab, which has developed smart-home-for-seniors technology platform using open technologies. They were our primary partner in the pilot project. They will continue to develop interdisciplinary solutions and lend their expertise to the VillAGE Initiative, helping to introduce new technologies to older adults in an effort to reduce social isolation.

« Le laboratoire DOMUS est donc prêt à soutenir ce projet en engageant son expertise dans une démarche interdisciplinaire pour cerner les enjeux, élaborer des solutions appropriées et respectueuses et tester ces innovations sociales auprès des aînés. »

—**Hélène Pigot**, Professeure titulaire en informatique, Chercheuse au Laboratoire DOMUS et **Sylvain Giroux**, Professeur titulaire en informatique, Directeur du Laboratoire DOMUS

Concordia University: With their EngAGE and PERFORM centres, Concordia has undertaken to provide expertise in the development of programs, services and policy-development related to older adults.

“From prevention to big data insights to arts-based therapies, our researchers are harnessing the potential of treatments and technologies for better health for older adults and facilitating next-generation solutions to pressing issues facing cities around health and well-being.”

—**Christophe Guy**, VP, Research & Graduate Studies, Concordia University

Age-WELL is Canada's technology and aging network dedicated to the creation of technologies and services that benefit older adults and caregivers. They see the VillAGE Initiative as advancing their mission to develop a community of researchers, older adults, caregivers, partners and future leaders that accelerates the delivery of technology-based solutions that make a meaningful difference in the lives of Canadians.

“Our commitment to your proposal will be through providing access to our members, researchers, and stakeholders, and by providing your group with consultation on the various issues related to emerging technologies and smart cities.”

—**Alex Mihailidis**, PhD PEng, Scientific Director & CEO, AGE-WELL NCE Inc.

HEALTH PARTNERS

Working closely with the CIUSSS West Central, the Ministère de la Santé et des Services sociaux du Québec (MSSS), and other leading experts during the finalist phase, we learned that healthcare will increasingly become decentralized. Dependencies on hospitals will be reduced. The point of care will be wherever the patient is—whether at home, in community, or elsewhere. Digital health will continue to drive the way care is delivered and we will continue to see an increasing focus on prevention and prediction with the help of new and advanced technologies.

We will work with our healthcare partners through the VillAGE Initiative to lay the digital foundation in which smart cities and healthcare providers could deliver better care to the home and improve outcomes along the continuum of care. This would not only improve care in the future, but could for the first time actually begin to identify and pre-empt clinical problems before people require treatment.

Ministère de la Santé et des Services sociaux (MSSS), Gouvernement du Québec: The VillAGE Initiative is very much aligned with the orientations of the provincial health ministry, especially as relates to aging in place, and they fully support the project and will have a seat on the Governing Board. As they believe that this initiative will have

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concrete and positive effects on the well-being of older adults, they have expressed, in their letter of support, a desire to discuss a framework for sustainability.

> « Votre projet s'inscrit en cohérence avec les orientations ministérielles du réseau de services intégrés pour les personnes âgées et est intégrateur des divers services qui sont offerts dans une communauté impliquée activement auprès de ses aînés. »
>
> —**Natalie Rosebush**, Directrice générale adjointe des services sociaux et des services aux aînés, Ministère de la Santé et des Services sociaux du Québec

Integrated Health and Social Services University Network for West-Central (CIUSS West-Central Montreal): Our primary health and social services partner would act in an advisory role for our program governance, as well as information privacy protection and measuring outcomes. The alignment of our respective technological roadmaps and data integration would enable us to co-develop better patient care. They are most interested in partnering for the delivery of digital health on the VillAGE platform. If the future of care is where the patient is, then the first ones to get it will be the VillAGE participants on the platform.

> “Côte Saint-Luc's VillAGE Initiative would lay the digital foundation in which smart cities and healthcare providers could partner to deliver better patient care to the home and improve outcomes along the continuum of care.”
>
> —**Dr. Lawrence Rosenberg**, President and CEO,CIUSSS du Centre-Ouest-de-l'Île-de-Montréal | Integrated Health and Social Services University Network for West-Central Montreal

INDUSTRY PARTNERS

MEDTEQ: This industrial Consortium for Research and Innovation in Medical Technologies has committed to support the VillAGE Initiative through several forms of contribution: in-kind expertise via MEDTEQ staff and resources for the structuring of eligible collaborative projects as well as project management support; financial support from MEDTEQ for collaborative projects with industry which can represent a direct contribution of up to $500,000 per project year over three years (maximum $1.5M per approved project) and direct financing in accordance with the consortium's current program rules (maximum of $1M for the MEDTEQ tranche in a syndicated round of financing).

> “Our belief is that Canadian talents and entrepreneurs in partnership with our public health care system and communities, can develop and implement substantial cost savings solutions for the well-being and health of seniors and their families.”
>
> —**Diane Côté**, CEO MEDTEQ Consortium

Laipac Technology Inc.: Based in Richmond, Ontario, Laipac is an industry leader in mobile healthcare solutions, developing Internet of Things (IoT) products since 1999 that have been exported to more than 100 countries. We worked with Laipac during our pilot project around their feature-rich Look Watch product. In a complete implementation and rollout of the VillAGE Initiative, we would continue our collaboration towards creating a seamlessly integrated smartwatch for older adults offering more convenience, safety, and social connectedness.

> “Should the city be a winner in the Smart Cities Challenge, we would welcome the opportunity to collaborate further on a broader rollout that would meet your program vision and resident needs.”
>
> —**Diego Lai**, CEO, Laipac Technology Inc.

ECONOMIC DEVELOPMENT PARTNERS

Agence Ometz and **PME Centre West Montreal** are two organizations which promote employment and entrepreneurship and which have committed to work in close collaboration with the VillAGE Initiative. As more fully described in Chapter 9, these agencies provide advice and guidance for business start-ups and offer services to entrepreneurs and job seekers.

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COMMUNITY PARTNERS

Cummings Centre, St. Patrick's Square, and B'Nai Brith Canada: There are at least three subsidized residences for independent older adults who have indicated serious interest in collaborating with this Initiative: Caldwell Residences, B'nai Brith and St. Patrick Square. St. Patrick's has already proven to be an invaluable partner in the pilot project and will be again during implementation. They are investing in smart building technology in partnership with the City and its residents. By deploying the VillAGE devices into a few of the older adults' apartments in each building in collaboration with the building's administration, we will be able to measure performance and success in a controlled trusted environment, which will allow residents to remain in their homes longer without having to go to assisted care.

5.4 RISKS AND MITIGATION

The risks related to governance are outlined in the table below.

Risks	Mitigation Plan
Potential for ambiguity of roles and responsibilities	Sign written agreement outlining the relationship between the NPO and the City, including financial arrangements, in-kind donations, human resource allocation, service harmonization and any other shared issues. Develop comprehensive guidelines on roles and responsibilities within the NPO for each level including: • Level and form of engagement of different actors. • Delegation of authority. • Scope of operation and the origin of funding. • Relationship with each other and other partners or stakeholders. • Level of assistance and support with each other. • Explicit mandates of each. • Partnership agreements and scope. • RACI Chart. Create codes of conduct and ethics for the Governing Board and employees.
Outsourcing technology development	Clearly define in a contract agreement the scope, deliverables and timeline for the development of the technology platform, including adherence to privacy policies and procedures, and relationships with other partners.
Human Resources—Finding suitable candidates, start-up very tied to specific people, creating organizational culture	• Build a Human Resource Management Plan that is integrated with decision-making throughout the organization and which has built-in succession-planning. • Develop clear job descriptions with performance outcomes that are aligned to the values and mission of the organization and which incorporate diversity and inclusion. • Create a recruitment strategy to find the best candidates for each position. • Create an organizational chart. • Develop an onboarding program. • Develop a training program to fill skill gaps for both management and employees. • Develop a performance appraisal and recognition program. • Include a liability insurance plan to cover for long-term management absences.
Cash Flow and Collection cycles based on Milestones—continuity breakdown	Clearly define outcome performance agreement per project with the Government of Canada to ensure continuity of projects and outcomes.
Time Escalation on Deliverables	Chart starting and projected delivery date for each activity output on a development chart to measure, control and manage possible slips and adjust when needed.

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Chapter 6 ENGAGEMENT

This chapter is a summary of what we have learned through community engagement activities to date and our Community Engagement Plan for the next phase of this project. We will also highlight the opportunities for ongoing conversation with our residents and other important stakeholders, which will help define and shape the VillAGE Initiative.

During our community engagement phase, we sought feedback from seniors, caregivers, and other stakeholders in the community in three main areas:

- The needs, worries and challenges they experience as they or their loved one age in community.
- How they view the role of smart technologies to help them age in community.
- How they view the role of the City in supporting aging in community.

Focus groups, public consultations, advisory committee meetings, and a pilot project have been vital. They have created a common understanding and a space for ongoing dialogue with residents. We gathered insights on current issues that are important to them and their families related to aging in community. Residents liked the open, two-way dialogue. They proposed ideas and came up with collective solutions. The meetings also confirmed for us the real needs and desired outcomes of our residents.

During the next phase of the VillAGE Initiative, we will make efforts to expand the number and diversity of the voices providing guidance in the development of the VillAGE Initiative.

6.1 SUMMARY OF RESULTS OF COMMUNITY ENGAGEMENT ACTIVITIES TO DATE

We worked with the following groups and organizations:

- Côte Saint-Luc programs and services including the public library, Aquatic and Community Centre (ACC), Emergency Medical Services EMS), volunteer Citizens on Patrol (vCOP), volunteers
- Research partners from the Montreal Geriatric Institute
- St. Patrick Square pre-retirement community
- Cummings Centre

We conducted the following community engagement activities, which have driven the direction of this proposal:

- Community engagement planning and visioning
- Information sessions
- Focus groups/action research
- In-person public consultation
- Online public consultation
- Senior advisory group meetings
- Project website
- Pilot project

Several key themes emerged through this engagement effort. They are summarized here with explanations in the next sections:

- Older adults would prefer to age in place, yet face a variety of challenges to doing so.
- Smart technology designed for convenience, safety and social engagement can be used to help give older adults and their caregivers peace of mind when aging in place.
- Technology needs to be simple to use, affordable, older-adult-friendly, and customizable.
- While privacy concerns did emerge, most people expressed that they would let go of some privacy in order to have more security as long as privacy was protected.
- Residents expressed a strong level of confidence and trust in the City of Côte Saint-Luc.

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n infrastructure already in place in Côte Saint-Luc for this initiative to

t the human element—it's not about people to technology but about people to people using technology.

6.2 COMMUNITY ENGAGEMENT VISIONING

Between June 2018 and September 2018, the VILLAGE Initiative team clarified the community engagement issue, developed principles for community engagement and defined the community to be engaged.

6.2.1 Community Engagement Principles

Inclusivity: The City encourages participation by those who will be affected by a decision. We want people to feel agency, to enable them to make a meaningful contribution to their community to matter what their age or background.

- **Connectivity:** The City aims to create networks of community members, linking people from different backgrounds to the City and to each other.
- **Coordinated approach:** The City coordinates community engagement activities to use resources effectively. Residents and community groups are our partners.
- **Open and timely communication:** The City provides information that is timely, accurate, accessible, easily understood and balanced. Public engagement processes will be designed to involve the appropriate people at the appropriate time in the appropriate way.
- **Transparency and accountability:** The City explains its governance processes to residents and ensures that information is readily available to the public.
- **Change and continual improvement:** As technology and circumstances changes, so too will the City. Continual feedback from residents will ensure that the City evolves with them and their needs.

6.2.2 Understanding the Community

While older adults are the target population for this Smart Cities Challenge initiative, many other groups of people will be affected by it as well including families, caregivers, neighbours, future older adults, residences, partners, health care professionals, city staff, and city councillors. Each of these groups have their own needs and concerns and we wanted to ensure they each had the opportunity to participate in community engagement activities. Engagement efforts were conducted with a focus on equity to connect with the broadest cross-section of the City of Côte Saint-Luc population, including focusing on reaching under-represented people.

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Chapter 6 ENGAGEMENT

6.3 COMMUNITY ENGAGEMENT PLAN

In September and October 2018, we developed a Community Engagement Plan with scope, timelines, locations, costs, and responsibilities to ensure that residents were given opportunities for various levels of participation, from receiving information, to being consulted, to collaborating and active participation. Below is a summary.

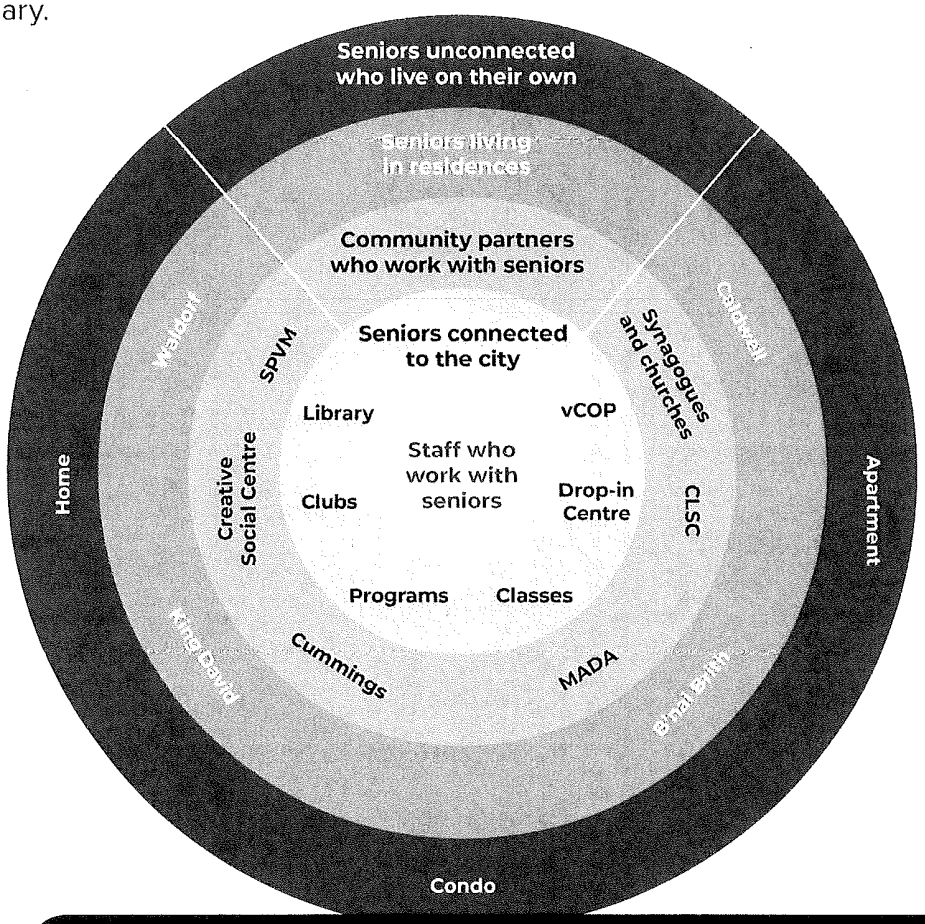


Figure 6-1: Illustration showing the concentric circles of connectedness to the City, from most connected in the inner circles, to least connected in the outer circles.

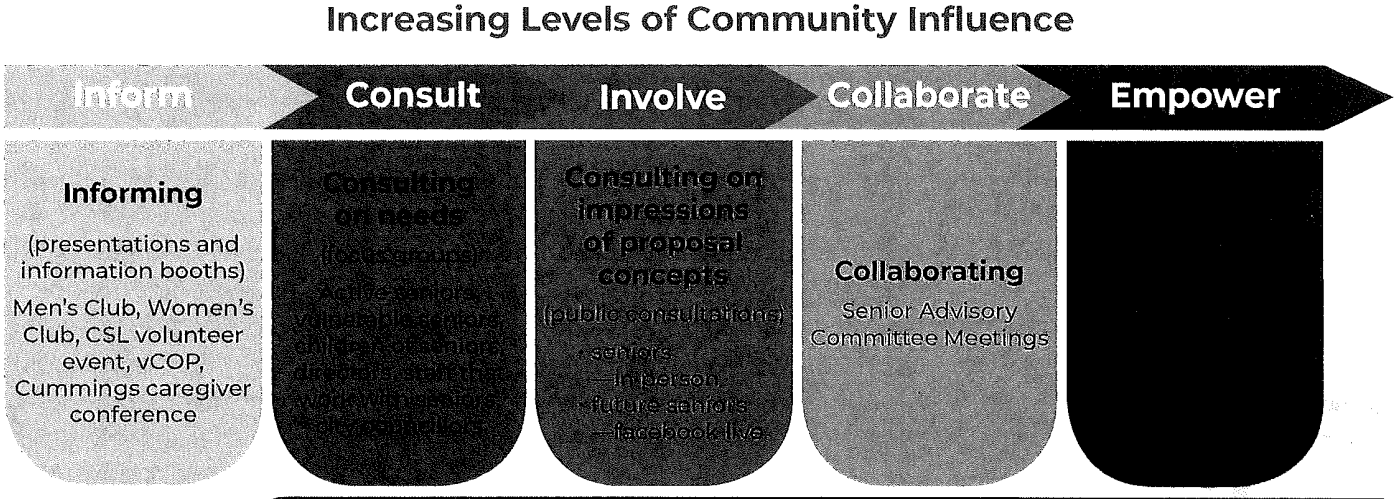


Figure 6-2: Chart illustrates five increasing levels of community influence including inform, consult, involve, collaborate, and empower.

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6.3.1 Summaries from Engagement Activities

We conducted more than 15 community engagement events with more than 1,000 residents from November 2018 to January 2019. We also sent letters to 14,000 households with information about the project and an invitation to participate in the public consultations.

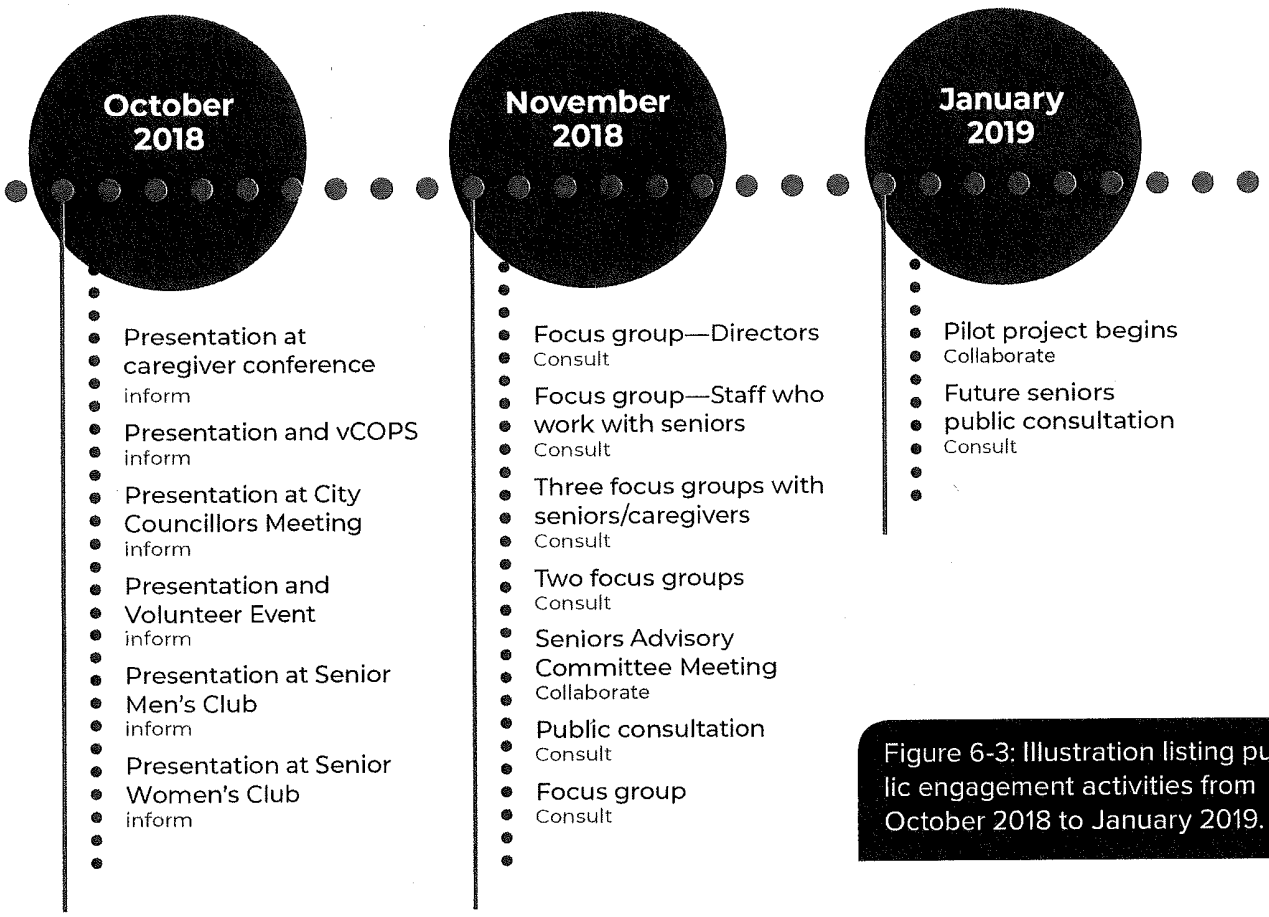


Figure 6-3: Illustration listing public engagement activities from October 2018 to January 2019.

6.3.1.1 Inform: Going Out Into the Community

The first phase of community engagement was informing stakeholders and residents about the Smart Cities Challenge and inviting them to participate in various activities. Information presentations and booths with invitations to sign up to participate in engagement sessions were given to the Côte Saint-Luc Men's Club, the Côte Saint-Luc Women's Club, a Côte Saint-Luc volunteer appreciation event, vCOPs, and a Cummings Caregiver conference. We connected with, informed and invited more than 1,000 people as a result of these informational sessions. We also spoke on local television, used Facebook and Twitter to share our progress, and produced videos to update residents.

6.3.1.2 Consult: Focus Groups

We conducted focus groups with our research partners to determine the most pressing needs of older adults when it comes to aging in place. The focus groups helped to ensure that everyone had the same understanding of the project and to prioritize needs for the proposal. We met with six groups of people (ranging from 4 to 12 people per group) including active older adults, vulnerable older adults, children of older adults, senior City staff, staff that work with older adults, and City Councillors. All groups were asked the same questions following a structured interview guide. During these focus groups—despite some differences between them—we were able to see trends emerge in terms of challenges to aging in place,

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perceptions of technology, how Côte Saint-Luc has a lot of resources that it can leverage, and privacy concerns. The results of the focus groups helped the team come up with the concepts of the VillAGE Initiative Proposal: smart technology for convenience, safety and social engagement through a connected community of people helping people.

What we heard

We heard four broad themes from the focus groups, which can be summarized as follows:

1. **Challenges to aging in place:** social isolation, safety and insecurity, health care system, desire to remain autonomous, mobility, accessibility, daily tasks caregiver burden
2. **Perceptions of technology:** older adults learning curve, socio-economic gap, human connection, purposeful, simple, passive, reliable, caregivers (collect objective data for decision making), connect with others in city for help with daily tasks
3. **What the City can leverage:** confidence/trust in the city, public library and Aquatic and Community Centre are main hubs, partners with community organizations, "connector" role, advocacy and informational support, infrastructure already in place
4. **Privacy concerns:** hackability, theft, what will happen with the data, must be individualized, trustworthy technical support (choosing, installing, ongoing help), manage the privacy risks not avoid them (safety number 1 priority)

6.3.1.3 Involve: Public Consultations

We organized two public consultations to understand the impressions of Côte Saint-Luc residents regarding the concepts being submitted in the proposal, that is, the VillAGE Initiative and smart technology for convenience, safety, and social engagement.

CONSULTATION NO. 1: The first consultation attracted 81 participants. It was conceived for older adults and to be participative in order to share concepts from the Smart Cities Challenge and gain impressions of older adults.

What we heard

We asked participants to draw a **care map** indicating who they would call during an emergency or if they need help with something. The results were surprising. Some people indicated family or friends close by, or a neigh er, health care professional or comm that they rely on for support. Howe ple expressed that they were alone relied on emergency services for e ations. Nobody listed the City as a care map.

meaningful engagement

After the VillAGE Initiative concepts ed, the participants asked what, if anything gave them **peace of mind** about the project. They indicated that they like the VillAGE initiative for both social engagement and security. The people-helping-people approach resonated with participants, as did the concept of village as a way to build community and feel connected and less isolated. They liked the idea of healthy older adults helping isolated older adults and having someone "be there without being there." Others appreciated the safety and security that it could bring to people who live alone.

We asked about **concerns** related to the project. Participants raised several issues related to privacy, accessibility, and the human element. For privacy, participants expressed concerns around invasiveness, hackability, and what would happen in the event of power failures or malfunctions. For accessibility, they had concerns about affordability, language, simplicity of technology and adaptations for people with hearing, vision, speech and mobility impairments. For the human element, they said that technology without people will not be accepted, and that we can't forget about the human element.

CONSULTATION NO. 2: The second consultation was for future older adults (ages 40 to 64) and was facilitated by the City Manager, the Mayor and two municipal councillors. It was streamed on Facebook Live. Participants were asked for feedback on the proposal and its impact on them as they age. Twenty-two participants attended this event.

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We asked participants how they would define **Thriving** as it relates to aging. Their answers focused on feeling connected and contributing to society, remaining active and engaged and having a sense of meaning and purpose. The perceptions of and interest in the **VillAGE Initiative** were very positive with participants reflecting on that fact that this would have an "amazing positive impact in the event of a major event like last years heat wave" and that this would be "one less barrier for older adults." They suggested that municipalities be at the frontlines for preventions and work closely with public health agencies. This age group is prepared to give of their time to help support the initiative.

6.3.2 Collaborate: Senior Advisory Council

A permanent Côte Saint-Luc Senior Advisory Council was established and its first meeting was held in November 2018. Chaired by the City Manager, the members of the Senior Advisory Council included several senior members of the community, volunteers, community partners, elected officials, and city staff who work with older adults. The first meeting focused on the Smart Cities Challenge, and feedback about what was proposed. Thoughts and concerns included:

- Ease of use related to technology
- Lack of WiFi
- Potential costs and accessibility
- Transportation
- vCOP able to make a positive contribution
- Volunteerism deemed to be an important part of the project

6.3.3 Empower: Pilot Project

We launched a pilot project in January 2019 with research partners from the Montreal Geriatric Institute. We implemented smart technologies and monitoring devices into the homes of five older adult participants. The purpose was to get preliminary information on the level of usability and acceptability of the technologies. The five were selected from a pool of more than 15 older adults who showed interest in participating in the pilot project. The five were selected based on predetermined criteria (e.g., living alone, WiFi at home, no big pets, etc.). While we used a convenience sample, every effort was made to ensure a diverse group in terms of gender, language and socio-economic status.

Demographics of pilot participants:

- 3 men, 2 women
- 3 apartments (1 specifically for autonomous older adults), 2 single-dwelling homes
- 3 have involved family living in Montreal, 2 do not
- Age range: 65 to 93

All participants expressed challenges related to safety in the home, performance of instrumental activities of daily living, and fear of falling. None of them had any cognitive impairments, and two shared that they were experiencing some symptom of depression.

During the first meeting, participants signed consent forms and sat for a short interview and completed standardized questionnaires. During the second meeting, we implemented the technology and offered education in learning how to use it. Ongoing support was provided. Only one participant has been involved long enough to have participated in a follow-up interview to discuss perceptions on usability and acceptability

What we learned

A few weeks after installation, participants were asked questions about the usability and acceptability of the technologies. In general, participants expressed:

- The sensors did not feel invasive
- The level of support provided during installation was excellent in terms of explanations received. The letter that was created to describe the process which was given to each participant is attached.
- Alexa was especially appreciated, however participants wished it was programmed to do more things—such as making calls to family and friends

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- Aside from the Alexa, the rest of the technology had no impact on improving or hindering daily activities
- The installation of the sensors and lights was not always done satisfactorily and they fell off—several visits were often needed to ensure that sensors were installed properly
- Participants need access to training and support to ensure the proper use of smart home technologies
- One participant was given a Laipac watch that had fall detection and SOS button functions—however, it kept giving false alerts and therefore was not satisfactory and [redacted] disabled during the pilot. Furthe[redacted] device is warranted.
- Participants would be willing to [redacted] ware and some monitoring sub[redacted] however reported that subsidie[redacted] be available for people who ca[redacted] this point they were not comfo[redacted] ting to a price they would be willi[redacted] they do not know exactly what they would be receiving or how it would help.

See Appendix for consent forms, letter given to participants, and preliminary report.

6.4 COMMUNITY ENGAGEMENT STRATEGY FOR THE NEXT PHASE

During the next phase of the Community Engagement strategy, we will focus on equit[redacted] connected with an even broader cross-section of Côte Saint-Luc population. We want to r[redacted] resented and health-disparity populations, increase stakeholder involvement, and distr[redacted] materials in a more targeted and strategic manner. We will continue to work closely witl[redacted] and other partners working with specific populations and communities to provide ongoin[redacted] in a variety of formats for residents and stakeholders to share experiences and ideas [redacted] Initiative. Given the opportunity, we will focus on adding the following principles to our [redacted] gagement Strategy.

6.4.1 Outreach

We will take engagement to places where people are already congregating, setting up pop-up workshops at community events and popular destinations to make it easier for community members to provide their comments without having to attend a separate meeting. This will help us to ensure that the right community members are at the table.

6.4.2 Participative Approach

The process and structure of community engagement activities will allow for all voices to be heard and equally valued. Community members will be involved in developing the VillAGE Initiative from conceptualization, to implementation, to evaluation, to ensuring it is culturally sensitive.

6.4.3 User-friendly Material

To effectively communicate with m[redacted] public, we will develop welcoming jargon-free community engagement[redacted] are visually attractive and written w[redacted] derstand language. Bright stickers, pens and markers will be provided share comments.

6.4.4 Design-Thinking Approach

In order to ensure that the best, most impactful services will be delivered, we will apply IDEO's Design-Thinking process (described below):

- **Empathize:** Learn about the audience through observation, seeking to understand users' perspective

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- **Define:** Construct a point of view based on user needs
- **Ideate:** Brainstorm and come up with creative solution
- **Prototype:** Build representations of ideas
- **Test:** Test ideas through prototyping, pilot projects

Once tested, the developers of both technology and social transformation will loop back into the relevant phase to re-define, re-ideate, re-create a prototype, and re-test until the service works and satisfies user needs and expectations. This process puts community engagement at the heart of design and innovation and allows the actual users to share their experience of a service with those who will be delivering it.

In addition to traditional community engagement activities including presenting at conferences and events, focus groups, and mailings, additional efforts to engage residents will be made in person and online.

6.4.5 In-person Activities

Activity	Description
Senior Advisory Committee meetings (4 meetings per year)	Composed of health care professionals, older adults, caregivers, and city staff. The primary role is to: • provide multidisciplinary, well-rounded perspective on needs of older adults and caregivers and solutions • provide guidance on VillAGE initiative planning and implementation process • assist in disseminating information and serving as a liaison to community members
Pop-up workshops (2 to 4 per year)	Informal engagement opportunities strategically located in places where people are already congregating including the library, the Aquatic and Community Centre, the malls, community events, parks and other popular designations. These workshops will include opportunities to interact with the smart technologies that making learning about the project and sharing ideas easy and inviting. Pop-up workshops enable people to share comments quickly, provide materials for participants to engage with online materials on their own time, and capture the perspectives of people who may not ordinarily attend more traditional workshops.
Listening sessions (4 per year)	Listening sessions, like pop-up workshops, take the meeting to the people. However listening sessions typically take place at a regular meeting of a pre-existing group. For example, a listening session may take place at a Senior Men or Women's Club meeting, or at an activity taking place at a local residence or community centre. Listening sessions enable people to participate in the planning process at meetings they already attend regularly, and provide an opportunity for in-depth discussion with specific demographic or special interest groups within the community.
Showcase with user experience sessions (2 per year)	Innovation-through-design thinking is a structured, human-centered method for creatively solving complex problems that inspire and delight users. Using iterations to: • test and stage • refine prototypes and solutions • learn more about user • refine solutions
Individual interviews (at least 10 individuals)	Individual interviews with residents who are homebound and cannot participate in the focus groups or other community engagement activities

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Activity	Description
Thrivability sessions for the VillAGE Community App (monthly)	Working with an experienced facilitator, we will work with residents to cultivate the fertile conditions for the VillAGE Initiative to be successful and for older adults to age in a place of their choosing, closely connected to their communities with the supports and tools they need. We will explore aging of their own design, opportunities for residents to use their talents to improve the VillAGE and plan social activities that minimize isolation and promote interaction and trust within the village community, between individuals who ask for help when needed and individuals who offer help. These sessions will help to fill the gap and allow meaningful engagement and initiative of the VillAGE before service delivery can begin.

6.4.6 Online Activities

Activity	Description
Website	VillAGE Initiative website will be maintained and expanded to communicate general project information, announce events and engagement opportunities, and house online engagement tools like the survey. The project website will also provide an area for people to share open-ended comments related to the project and to opt into the mailing list and receive e-mail updates.
Survey	An online survey will be developed and accessible directly through the website. Hard copy forms will be available as well. The survey will be developed with our research partners to ensure reliability and validity.

6.5 RISKS AND MITIGATION MEASURES

Risks	Risk Mitigation Plan
Low engagement levels of identified target groups, which can jeopardize the success of the onboarding stage of the platform and service delivery buy-in	• Ensure tools and locations of community engagement are accessible and spread out across the City of Côte Saint-Luc • Focus on outreach and bringing engagement opportunities to where people congregate using pop up workshops and listening sessions
Community concerns, needs and questions not sufficiently addressed, jeopardizing success and sustainability of platform and service delivery	• Design community engagement sessions to ask the right questions • Give residents many opportunities to express their needs, concerns and questions
Lack of information or misconceptions about the project and its outcomes leading to disillusionment of participants	• Ensure transparency in community engagement sessions in terms of where we are, where we are going, and how information gathered from residents will be used in developing the VillAGE Initiative • Communicate updates and how they like to findings from community engagement
Interactions & discussions during engagement activities going off tangent or being monopolized by a few participants	• Use facilitators with extensive experience in dealing with difficult group dynamics and keeping discussions on track
Long lag time between community engagement and onboarding of platform and service delivery phases of the project	• Plan on-going engagement activities including regular brainstorming and working session where residents can play a large role in the development of the ViLLAGE Community App (people helping people)

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Chapter 7 DATA AND PRIVACY

This chapter is to be read in close conjunction with the Preliminary Privacy Impact Assessment (PPIA) and documents which have been placed in the Confidential Annex on Privacy.

7.1 CONTEXT

Many private companies in the world market are promoting the use of smart home solutions for older adults, but without the rigorous data governance rules and oversight that are necessary to protect users' sensitive personal and health information. Who owns the sensors, who has access to the data they collect, and what the data can be used for are all issues arising from the proliferation of tracking and monitoring devices and systems. In the hands of private companies, individuals' personal information is often leveraged and commercialized for targeted marketing and other purposes, as has been recently revealed in other smart city projects. [5]

The VillAGE Initiative is committed to the highest standard of privacy and data protection. Privacy-By-Design is built into the VillAGE Initiative and will become the standard for other Canadian cities that adopt this program. This will put Canadian cities on the map for the Cities Coalition for Digital Rights, a world initiative to promote and track progress in protecting residents' digital rights in cities. [6]

7.1.1 The New Organization

The VillAGE Initiative will reside within a third-party non-profit entity created to manage the VillAGE Initiative. The structure and governance of the new organization would ensure that data collected, created, and generated by the VillAGE Initiative would continue, in perpetuity, to be subject to data protection and access rights and responsibilities applicable to the City and all provincial "public bodies." Since the new organization will be constituted in compliance with the *Quebec Act respecting Access to documents held by public bodies and the Protection of personal information* it will have all the duties, obligations, and rights to protect the data which will be generated by this Initiative.

According to the VillAGE Initiative Governance Model, one member of the Governing Board will be a privacy expert so that we maintain data governance and privacy protection as a constant consideration throughout the execution, implementation and entire lifecycle of the project.

7.2 THE PRELIMINARY PRIVACY IMPACT ASSESSMENT

At the very early stages of the finalist phase, the City of Côte Saint-Luc engaged Sharon Polsky, President of AMINAcorp.ca, President of the Privacy and Access Council of Canada, and a Privacy by Design Ambassador with more than 30 years experience, to consult and advise the Côte Saint-Luc Smart Cities Team in the preparation of this VillAGE Initiative proposal.

As is more fully elaborated in the Preliminary Privacy Impact Assessment (PPIA), which is included in the Confidential Annex of this proposal, the privacy consultant conducted a thorough assessment of the City's information protection and privacy compliance policies. As a result, she prepared a very exhaustive PPIA with 91 recommendations. Furthermore, she proposed that the City adopt an Information Privacy Protection and Governance Policy Framework, and the City is prepared to adopt that Policy Framework in a timely fashion. In addition, the City envisions incorporating the suggested Policy Framework and the recommendations into the articles of incorporation of the new

[5] "Smart Cities May be too Smart for their Own Good" National Post Feb 2 2019 in the Appendix https://business.financialpost.com/technology/smart-cities-may-be-too-smart-for-their-own-good

[6] See Bianca Wiley (@ biancawylie) Senior Fellow at the Centre for International Governance Innovation and co-founder of Tech Reset Canada "Why we need to push for data rights in Canada. "in the Appendix https://business.financialpost.com/technology/why-we-need-data-rights-not-everything-about-us-should-be-for-sale

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VillAGE Initiative non-profit organization as part of its creation.

The Policy Framework is intended to provide the foundation of the City of Côte Saint-Luc's Information Security and Privacy Protection program, and enable the City and the new VillAGE Initiative organization to effectively identify, manage, and mitigate the risk of data exposure or compromise within the organizations' computer and information-handling systems and the technology and communications devices under their control.

All the essential elements related to privacy in support of this project are addressed in the PPIA, including compliance with all relevant privacy regimes, types and methods of data collection, and efforts and recommendations to adhere to the ten universal privacy principles which are the foundation of the Fair Information Principles that form the basis of Canada's Personal Information Protection and Electronic Documents Act (PIPEDA). Certain additional elements relating to privacy merit to be highlighted in this section which is not covered by confidentiality.

7.3 PRIVACY BY DESIGN AND HOW PUBLIC CONSULTATIONS INFORM DESIGN

The City of Côte Saint-Luc, in conjunction with academic and research partners and members of Quebec's health care profession, held several in-person public consultations and focus group discussions with a broad range of Côte Saint-Luc residents, their families, caregivers, and the staff who serve them. Consultations were intended to (and did) elicit feedback, concerns, and questions about the VillAGE Initiative in general, and privacy implications and concerns in particular. It should also be noted that, pursuant to this exhaustive engagement exercise and the implementation of the pilot project in the homes of five independent older adults, issues around privacy and security were raised. All of those concerns (see Chapter 6: Community Engagement) were addressed and integrated into the design of the project. For instance, feedback indicated that:

- The solutions offered need to be customized to each individual's level of comfort with technology in general and monitoring technologies in particular, since some participants will want monitoring via cameras and others not;
- The person who recommends devices and the one who does the installation must be trustworthy and accredited;
- The use and distribution of data must be totally secure and not available to any third parties without participants' explicit consent.

Residents who were consulted and those who participated in the pilot project understood that some risks (such as power failures or personal home intrusions) are unavoidable, but were prepared to play a role in managing risks in collaboration with the VillAGE team. The partnership with researchers (including those involved in the pilot project) was also seen as providing a positive ethical approach that could further enhance the design of the VillAGE Initiative.

7.4 OPENNESS AND BIG DATA

The City also believes that providing open access to project data about the VillAGE Initiative must—and can—be done in a manner that genuinely respects privacy and governing law; and that strategy can—and will—invite innovation using anonymized data in a way that genuinely respects individuals' privacy.

The VillAGE Initiative and the City will adopt a communication plan to explain to the public the policies and practices relating to the proposal's management and handling of personal information.

In addition, information management and other policies will be available online and by request as suggested in PPIA Recommendation 87—Access to Policies—ensure consent and notice provisions governing the collection, use, disclosure, and disposition of personal and health information through the VillAGE Initiative are made publicly available through the City website or a dedicated VillAGE Initiative website.

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7.5 FINAL COMPREHENSIVE PIA

As a fundamental component of developing the City's final proposal, we have addressed the privacy concerns through the Preliminary PIA and resolved issues that became apparent during the pilot project. For example, we prepared plain-language consent forms and pilot project participants were asked to sign both the City's consent forms and were invited to sign the consent for their information to be collected by our research partners from the Université de Montréal, whose consent forms are government approved.

If Côte Saint-Luc is selected as a winner of the Smart Cities Challenge, we will conduct a comprehensive Privacy Impact Assessment to ensure that VillAGE participants' information is adequately safeguarded, whether through collaborations with research and healthcare partners or in relation to the technology and devices employed in the VillAGE Initiative.

Furthermore we will rely on the advice and guidance of our major health partner, the CIUSS Centre Ouest-de-l'île de Montreal/Integrated Health Network for West Central Montreal, headed by Dr. Lawrence Rosenberg whose letter of support indicates its intention "to collaborate with Côte Saint-Luc in an advisory role regarding its program governance, alignment of technology roadmaps and data integration aimed at augmenting Patient Health records as well as information privacy protection."

This collaboration has already started in that they have shared with Côte Saint-Luc the policies, laws, regulations, and directives that will guide our information security and data governance once we begin to service those residents of our city who are patients in their health network.

This model of collaboration will serve other communities across the country when adopting the VillAGE platform.

7.6 PRIVACY COMMISSIONER OF QUEBEC

The City of Côte Saint-Luc submitted the draft PPIA to the Privacy Commissioner of Quebec (see letter in the Confidential Annex). After due consultation with the Privacy Commissioner's office, we revised the PPIA to address all of its concerns and included its recommendations.

7.7 RISK STRATEGY

The PPIA identified a broad range of risks and unintended consequences that could result from the creation and implementation of the VillAGE Initiative, and provided detailed recommendations and strategies to mitigate the risks, which are outlined in the four key findings:

Finding 1—Beyond the Baseline

The wealth of sensitive personal, health, and financial information that will be collected, used, and disclosed in the VillAGE makes it clear that it is incumbent upon both the City of Côte Saint-Luc and the VillAGE non-profit organization to go beyond the baseline requirements of the privacy laws.

Côte Saint-Luc must ensure that information is collected and disclosed at the right times, for the right reasons, to the right parties, and in the right amounts, and ensure that the personal information is protected against such risks as unauthorized access, collection, use, disclosure, disposal, and loss of use throughout its lifecycle and to a degree that is appropriate to the sensitivity of the data.

Finding 2—Prevention is Key

The intentional reliance on technology to enhance independent living demands adequate controls for securing all information in the VillAGE (regardless of its form or format) against unauthorized access, use, disclosure, loss, loss of use, and destruction. The importance of minimizing the personal and health information collected, and prop-

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erly safeguarding it throughout its lifecycle, cannot be overstated.

Accordingly, it is essential to ensure that effective encryption is required in all elements of the VillAGE; that all VillAGE data be categorized and segmented, de-identified and encrypted at source, at rest and in transit through its entire lifecycle; that use by third parties be limited by non disclosure agreements and contracts that articulate strict limits on sharing, access by further third parties, and data location; and that both Privacy by Design and Privacy by Default be embedded and required as the de facto standard in all elements of the VillAGE so that it genuinely respects privacy while facilitating innovation and scalability.

Finding 3—Participants Must Be in Control of their own Information

The desired outcome of the VillAGE Initiative will rely on individuals voluntarily joining the VillAGE Initiative; but they will trust and use the "smart" VillAGE solution only if they are satisfied that it provides adequate confidentiality and privacy, and that it enables them to have explicit control over whether and what information about them is (and is not) collected, who has access to which parts of it, and that they can have access to their own information when they want or need it.

Finding 4—Maintain Primary Control over Information, and Control Secondary Uses

The collection, processing, storage, retention, and management of personal and health information might rely on third parties. Accordingly, it is essential that clear and unambiguous language limit vendors or other third parties from releasing/revealing personal/health information to subsequent parties, and that such limiting language be embedded in all agreements, bid processes, and purchasing policies/procedures relevant to the VillAGE Initiative.

Comprehensive protection of personal and health information can be attained—throughout the data lifecycle—by the City of Côte Saint-Luc creating a separate organization to manage the VillAGE Initiative, thereby facilitating data sovereignty and ensuring that VillAGE data would continue to be subject to data protection and access rights and responsibilities applicable to the City.

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Chapter 8 FINANCIAL

8.1 INTRODUCTION

This chapter describes the five-year financial plan for the VillAGE Initiative program including estimates for expenses and revenues along with a detailed financial analysis. This financial plan adopts a top-down forecasting approach.

Program Overview

The VillAGE Initiative program is comprised of five projects and 40 core activities focused on the implementation of a Connected Framework in the City of Côte Saint-Luc as defined in the Challenge Statement and aligned with milestones payments for outcome achievement defined in the Performance Measurement chapter.

Management and Oversight

The VillAGE Initiative management and oversight for accounting and financial projections will be the responsibility of the Chief Financial and Operations Officer (CFO).

8.2 PROGRAM COST ESTIMATES

The total estimated cost for the VillAGE Initiative program over five years is $10 million with a $405,000 in-kind contribution from the City of Côte Saint-Luc, which covers half of the CEO's salary ($375,000) and the first two years of rent ($30,000). The first table shows the breakdown by project (totals have been rounded to the dollar). The second table shows expenses by category.

Project	Total five-year cost in $CAD
Governance and Operations	$3,170,000
Community Engagement	$1,128,250
Platform Development	$3,362,000
Service Delivery	$1,719,500
Sustainability & Transferability	$629,250
TOTAL	**$10,000,000**

Table 8-1: Cost Breakdown by Project

Expense Category	Total five-year cost in $CAD
Management Costs	$6,965,000
Human Resource Costs	$867,000
Operating Costs	$2,195,000
TOTAL	**$10,000,000**

Table 8-2: Cost Breakdown of Expenses

Management Cost Allocation

Members of the Management Team, while defined in the Governance and Operations project, would allocate their time and work across projects according to their skillsets and expertise. Cost estimates have been allocated in the table below.

Management	Revenue Allocation in %	Annual Salary
CEO	40% Governance and Operations 35% Community Engagement 10% Service Delivery 15% Sustainability	$150,000 ($75,000 in-kind by the city)
CTO	40% Governance and Operations 40% Platform Development 10% Service Delivery 10% Sustainability	$150,000

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Management	Revenue Allocation in %	Annual Salary
Admin	40% Governance and Operations 20% Community Engagement 20% Service Delivery 20% Platform	$60,000
Marketing and Communications Coordinator	20% Governance and Operations 50% Community Engagement 30% Service Delivery	$50,000
Chief Financial and Operations Officer (CFO)	50% Governance and Operations 20% Community Engagement 10% Service Delivery 15% Sustainability	$120,000
Director of Community Engagement & Service Delivery	20% Governance and Operations 40% Community Engagement 40% Service Delivery	$100,000
Fundraising and Sustainability Manager	10% Governance and Operations 80% Sustainability	$75,000 starting second year

Table 8-3: Management cost allocation

Assumptions and Cost Estimating Methodology

Cost estimates were developed by breaking down each project into four major categories: (1) conception and planning, (2) implementation and operational results, (3) monitoring performance indicators, and (4) contingency and risk mitigation. The methodology for each element is further described below.

Cost Elements	Assumptions	Estimated % of Costs—five years
Conception and Planning	Final conception and planning of all projects and services are estimated at 85% of the total costs of management, additional resources and operating costs the first year and 25% each year after	$3,143,350
Implementation and Operational Results	All implementation and operational results are estimated at zero of the total costs of management, additional human resources and operating costs the first 12 months and at 62% each year after	$5,558,920
Monitoring Performance Indicators	Monitoring and reporting performance indicators per project costs are estimated at 10% of the total costs of management, additional human resources and operating costs for the five years	$1,002,700
Contingency and Risk Mitigation	Contingency and Risk Mitigation costs are estimated at 3% of the total five-year costs	$300,810

Table 8-4: Cost Elements and Assumptions

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8.3 FINANCING AND REVENUES

8.3.1 Introduction

This section presents the projected funding required to complete the program including projected revenues and assumptions.

8.3.2 Financial Plan Overview

This Projected Financial Plan reflects the planned funding strategy through which the VillAGE Initiative will be financed. This includes the $10 million start-up fund financed by Infrastructure Canada through 13 milestone payments and revenue generated from a number of sources to ensure sustainability and scalability in the long-term. These sources include user fees from smart device solution sales, partner subsidies, government grants, planned giving, endowment donations, and premium solution support services

With the aim of funding for sustainability, we have had a number of active discussions with financing partners who would provide additional capital to a $10 million prize from the Smart Cities Challenge. For instance, MEDTEQ have strong interest in supporting the VillAGE Initiative should we be a winner in the Smart Cities Challenge, as evidenced by their letter of support. MEDTEQ is the Industrial Consortium for Research and Innovation in Medical Technologies, which accelerates the collaborative development of innovative technologies for clinicians and patients and their validation and integration into Canadian and international health networks. Their support could include in-kind contributions as well as cash contributions of $500,000 per project year over three years (up to $1.5 million per approved project).

The letter of support from Concordia University confirms their strong interest in supporting the VillAGE Initiative. As a founding partner of MEDTEQ, Concordia University is open to providing in-kind resources, research grants and high-leverage project structuring to offer multiple matching funds to a $10 million prize from the Smart Cities Challenge.

We have included a full-time Fundraising and Sustainability Manager in our plan, starting in year 2, who would be focused on ensuring the achievement of our fundraising objectives towards short-, medium-, and long-term sustainability of the VillAGE Initiative.

The following table shows our revenue assumptions in more detail.

Description	Revenue Assumptions	Total Estimated Revenue for five years
Smart Device Solution Sales	Starting the fourth year, we estimate that 600 residents will purchase our smart device solutions at $1,200 annually for a total of $720,000, representing 10% of the 6,000 older adults who live alone in our city. Starting the fifth year, we estimate that 1,200 residents will purchase smart device solutions at $1,200 annually for a total of $1,440,000, which represents 15% of 6,000 residents + 50% (300) repeat customers from the previous year. We are working, through our partner financing efforts, to put in place a subsidy program for residents to purchase these solutions, based on income level and other factors.	$2,160,000

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Description	Revenue Assumptions	Total Estimated Revenue for five years
Partner Subsidies, Research Grants, Government Grants, Foundations	Starting the third year, we estimate based on our currently strong level of interested partners that we will be able to confirm three partner subsidy agreements: • $500,000 (third year) • Research and other government grants $1 million (fourth year) • Foundations: $500,000 (fifth year)	$2,000,000
Planned Giving and Endowment Funds	Starting the third year, we estimate, based on strong existing relationships with foundations that we will be able to set up a planned giving program and a VillAGE Initiative endowment fund: • Planned giving: fourth and fifth year • $50,000 each year for a total of $100,000 • Endowments: third, fourth, and fifth year: 20 donations at $1,000 each for a total of $20,000 each year	$160,000
Solution Support Services	Starting in the fifth year, we estimate that we will generate revenue from providing solution support services to (a minimum of) five cities in Canada at $50,000 each.	$250,000
	TOTAL	**$4,570,000**

Table 8-5: Revenue Assumptions

8.3.3 Financing Strategy

The projected financing strategy, or combination of financing approaches, will depend on market circumstances. However, we have developed a preliminary financing plan based on currently available program data and market circumstances. To the extent that additional data becomes available or market circumstances change, we will update the financial plan to account for these changes. See below for the financial details per project for the five years as well as the detailed financials of all the costs and the financial analysis summary of the revenues and costs for the five years.

8.3.4 Estimated Revenues Beginning Third Year

We will use the estimated revenue sources to finance additional human and material resources in three key projects: community engagement, platform development and service delivery. We anticipate an increase in:

- the number of older adults who will want to receive information on services and updates both in person and online;
- the number of lower-income older adults who might require subsidies to offset the monthly fees of their smart device solutions including hardware;
- the number of older adults who will want to purchase smart device solutions.

In all three cases, additional occupational therapists, case managers, smart device installers, help desk personnel, platform developers and hardware will be required. Additionally, with the MEDTEQ partnership, research and development of innovative applications and solutions to foster autonomy and a quality of life for older adults and their caregivers will be possible.

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8.4 ASSUMPTIONS, RISKS AND MITIGATION

The projected financial structure for the program includes the revenues that will be raised by the third year and milestone payment proceeds to pay for project conception and planning, implementation and operational results, monitoring performance measurements and contingency and risk mitigation phases by Infrastructure Canada.

The funding available for the project will be subject to risks that cannot be fully known at the time of this writing. The following is a summary of potential risks that may affect the financing of the project as well as the risk allocation analysis when assessing each project's advancement and delivery.

Risk	Mitigation
Liquidity Risk	Clearly define and execute outcomes-based performance agreement with Infrastructure Canada to ensure timely payments at milestones.
Longevity Risk	Clearly define and execute long-term revenue and financing outcomes to ensure sustainability of the VillAGE Initiative in fundraising and partner subsidy agreements.

Table 8-6: Risks and Mitigation Plan for Financial

8.4.1 Risk Allocation Analysis

The VillAGE Initiative will use a two-step screening process when assessing each project's advancement and delivery. In the first-step screening phase, project information and data are reviewed and assessed against a set of second-step screening criteria to determine feasibility and readiness of each. A project that does not meet some or all the first-step screening criteria may not advance or still may advance based on other considerations.

Project Deliverables	Is timeline of project activities realistic, with the right target and in allocated budget?
Funding Requirement	Does the project have revenue generation potential to partially offset the initial public funding?
Project Team	Does the project have all the necessary human resources to complete the deliverables?
Project Efficiencies	Is there an opportunity to bundle projects or create economies of scale?
Ability to Raise Capital	Can the outputs/deliverables help free funds or leverage existing sources of funds?
Ability to Transfer Risk	Can project help transfer risks and potential future responsibilities to the private sector on a long-term basis?

Table 8-7: First-step Screening for Risk Allocation Analysis

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Community Need	Does the project address the needs of the community? Does the project support improving the quality of life for older adults?
Community Benefits	Will the project bring wellness and social resilience benefit to the community? Does the project help achieve performance, and safety as outlined in Challenge Statement?
Social and Economic Development	Will the project enhance the City's social and economic development objectives?
Market Demand	Is there sufficient community appetite for the project—isolated older adults, caregivers, healthcare providers, etc.?
Stakeholder Support	What is the extent of support for the project? What strategies are proposed to involve partners, governments, and foundations in the project?
Legislative Considerations	Are there legislative considerations that must be considered?
Technical Feasibility	Is the project described in enough detail to determine the type, size, location, and proposed dependencies?
Project Risks	Are there any risks unique to the project that have not been outlined that could impair project viability?

Table 8-8: Second-step Screening for Risk Allocation Analysis

8.5 REPORT ON THE USE OF THE FINALIST GRANT, INCLUDING REASONABLE JUSTIFICATION OF ANY DIVERGENCES FROM THE PLAN LAID OUT IN THE APPLICATION

We did not fundamentally diverge from the core concept in our initial proposal, the SHARED (Senior Health and Real-time Environmental Data) Initiative, which was focused on leveraging and implementing smart devices and data technologies to keep isolated older adults safer, healthier, and more connected to city services while living at home.

As you will see in the attached Final Revised Budget, we applied the $250,000 finalist grant towards expenses mainly focused on consulting, professional services and various communications needs. The cost of equipment and technical services are far less than what we originally projected in the preliminary proposal.

Once we were selected as finalists, we set out to find advice from business and technology experts. In keeping with our municipal rules and best practices, we sought out competitive bids for the principal responsibilities of project management and technology strategy.

The first contract was given to Innovitech, a company with more than 25 years of experience as innovation strategists. We mandated Innovitech to assist us in developing the SHARED concept and mobilize key research, industry, academics, entrepreneurs and clinical partners in the field of medical technology and digital health. Through their initial mandate, we were introduced to a series of academics, researchers and government agencies. As well, we were invited to present and participate in an Innovation Summit on Medical Technology and Digital Health organized by Innovitech and MEDTEQ in January 2019.

In the summer of 2018, we hired Marc Chriqui from Delevante Software Inc. to be our Project Director and direct the development of the final proposal from concept to implementation of the pilot phase. Marc drove the finalist phase and oversaw every detail of the process from developing partner relations to researching technology, to making repeated presentations and participating actively in

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community engagement and drafting and preparing the final proposal. His compensation is based on monthly consulting fee.

Other professionals hired included Amina Inc. for the Privacy Impact Assessment. Erica Botner, Public Engagement Coordinator, was hired to work on engagement and oversee our pilot project. We also hired a public engagement animator for our city-wide engagement consultation and hired a professional business writer to help with the final drafting of the proposal.

Videography, legal fees and translation round out the professional services expenses. As can be seen from the final revised budget, hardware and equipment were not major expenses and this is in stark contrast to the initial budget that was presented in the initial application.

The major variance between the final revised budget for the finalist grant and the initial budget as proposed can be explained as follows:

The budget for the initial proposal of the SHARED project was very focused on sophisticated and expensive environmental, home and mobile sensors. The proposal was to run a "Living Lab" pilot project involving 100 isolated older adults, equipping their home with sensors, and personal GPS/fall sensors to trigger city services using a decision-making server that uses machine learning combined with an expert system. We also budgeted for the installation of an environmental sensor grid to test the solutions ability to monitor air and noise pollution.

Once we were selected as a finalist, it soon became apparent that this initial project was overly ambitious for the relatively short finalist phase. After consultation with our population, it was understood that the environmental monitoring was not a top priority for our residents in the initial phase of the project.

A total of 73 percent of the initial budget was focused on hardware, based on a very optimistic number of pilot participants and environmental sensors. This number turned out to be a logistical challenge, which we could not address based on the guidelines and recommendations of the Smart Cities Challenge.

As we understood from the start of the finalist phase, the pilot projects could only be implemented once we had conducted a thorough exercise in community engagement of our residents in order to really understand their needs and priorities. As well, we had to assess and evaluate the technical products that were readily available in the market, without the restrictions of licensing, non-compete and NDA agreements. The initial companies who we approached were very reluctant to allow us to integrate their devices in our pilot homes without very restrictive conditions, which we could not accept.

In the time available and based on feedback from community engagement, we preferred to focus on quality over quantity. The DOMUS Laboratory at the University of Sherbrooke offered us their connected home solution, equipment and expertise at a very fair price. This equipment is relatively inexpensive and the platform is based on open technologies that can be adapted to a diversity of older adults and home types depending on their needs.

Furthermore, we had to adopt protocols for the selection of pilot participants, which were also based on consent and privacy considerations that took time to implement. This included home interviews and assessment of needs. In order to customize the devices to the requirements of the users, we relied on the expertise of our Public Engagement Coordinator.

This explains the variance between the original budget and the revised budget. The former was based in large measure on hardware and technology while the later was to acquire professional services for strategic business development, project management and intensive community engagement.

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Finalist grant budget report

Item	Rev. Amount	Comments	QST (5%) Plus taxes	Budget	Actual 2018	Estimates 2019
	Feb. 4/19				Dec. 31/18	Feb. 4/19
02-801-00-114 - Consultants						
Consulting Services	85,000	Delevante Software - September 1, 2018 to May 15, 2019	4,250	**89,250**	41,995	47,255
02-801-00-112	28,224	Staff - October 19, 2018 to May 15, 2019		**28,224**	8,680	19,544
Public Engagement Coordinator						
02-801-00-311 - Travel						
Various travel costs (incl. conferences)	15,000	October 2018 and March 2019 trips, etc., 2-3 people per trip. (incl. QST portion)		**15,000**	5,298	9,702
02-801-00-317 - Meals and refreshments						
Meetings/events/etc.	1,000			**1,000**	413	587
02-801-00-332 - Communication Expenses						
Mobile phone/network/etc.	500			**500**	487	13
02-801-00-416 - Legal Services						
Legal Fees	7,250	Robic	363	**7,613**	7,612	
02-801-00-419 - Professional Services						
Consultant - Privacy	22,175	Amina Services	1,109	**23,284**	23,282	
Consultant - Animator (Public Engagement)	4,075	Alambic	204	**4,279**	4,279	
Videographer	15,000	Bowes Media Inc.	750	**15,750**		15,750
Business and Innovation Strategists	25,000	Innovitech	1,250	**26,250**	22,827	3,423
Pilot Implementation & Software Development	20,000	DOMUS	1,000	**21,000**		21,000
Drafting of Proposal	10,000	ib2ib	500	**10,500**		10,500
Translation	3,000		150	**3,150**	139	3,011
02-801-00-670 - Misc. Materials and Supplies						
Hardware and telecom (tech supplies)	1,270	DOMUS Hardware, Laipac Smartwatches, etc.	64	**1,334**	1,332	
02-801-00-699 - Equipment						
Servers	-			-		
02-801-00-420 - Misc. Services and Contracts	12,506			**2,868**	2,406	465
	250,000		9,639	**250,000**	118,750	131,250

Table 8-9: Accounting of Finalist Grant

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GOVERNANCE AND OPERATIONS

Management Team	TOTAL 5-YEAR COST
CEO	$150,000.00
CTO	$300,000.00
Admin	$120,000.00
Marketing and Communications Coordinator	$50,000.00
Chief Financial and Operations Officer (CFO)	$300,000.00
Head of Community Engagement and Service Delivery	$100,000.00
Fundraising and Sustainability Manager	$60,000.00
TOTAL	**$1,080,000.00**
Operating Costs	
Legal Costs	$100,000.00
IT Systems	$150,000.00
Translation	$25,000.00
Privacy Consulting	$125,000.00
Accounting Costs	$175,000.00
Marketing Budget	$50,000.00
Office Space/Centre of Excellence	$300,000.00
Travel	$85,000.00
Supplies and Equipment	$85,000.00
IT Infrastructure	$75,000.00
Other G&A incl. Contingency	$145,000.00
Liability Insurance	$160,000.00
Fringe Benefits - 20%	$615,000.00
TOTAL	**$2,090,000.00**
Stakeholders	
Partners, CSL: in-kind ($405,000)	$-
TOTAL	$-
TOTAL COST	**$3,170,000.00**

Table 8-10: Proposed spending—Cost per project: Governance and operations

COMMUNITY ENGAGEMENT

Management Team	TOTAL 5-YEAR COST
CEO	$131,250.00
CTO	$-
Admin	$60,000.00
Marketing and Communications Coordinator	$125,000.00
Chief Financial and Operations Officer (CFO)	$120,000.00
Head of Community Engagement and Service Delivery	$200,000.00
Other G&A incl. Contingency	$60,000.00
Fundraising and Sustainability Manager	$-
TOTAL	$696,250.00
Human Resources	
Facilitators	$200,000.00
Marketing Support	$160,000.00
Fringe Benefits - 20%	$72,000.00
TOTAL	$432,000.00
TOTAL COST	**$1,128,250.00**

Table 8-11: Proposed spending—Cost per project: Community engagement

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Chapter 8 FINANCIAL

PLATFORM DEVELOPMENT

Management Team	TOTAL 5-YEAR COST
CEO	$-
CTO	$300,000.00
Admin	$12,000.00
Marketing and Communications Coordinator	$-
Chief Financial and Operations Officer (CFO)	$-
Head of Community Engagement and Service Delivery	$-
Fundraising and Sustainability Manager	$-
R&D Manager	$300,000.00
Architect	$450,000.00
UI/UX Designer	$325,000.00
Developers/Engineers	$525,000.00
Integration Specialists	$325,000.00
Quality Assurance and Testing	$150,000.00
Technical Writer	$195,000.00
Tech Support	$360,000.00
Other G&A incl. Contingency	$60,000.00
Research Partners	$-
TOTAL	$3,002,000.00
Human Resources	
CTO + 12 resources	$-
TOTAL	$-
Operating Costs	
Equipment	$75,000.00
Server Infrastructure	$225,000.00
Design Tools	$15,000.00
Development Tools	$15,000.00
Testing Tools	$15,000.00
Documentation Tools	$15,000.00
TOTAL	$360,000.00
TOTAL COST	**$3,362,000.00**

▲ Table 8-12: Proposed spending—Cost per project: Platform development

SERVICE DELIVERY

Management Team	TOTAL 5-YEAR COST
CEO	$37,500.00
CTO	$75,000.00
Admin	$60,000.00
Marketing and Communications Coordinator	$75,000.00
Chief Financial and Operations Officer (CFO)	$60,000.00
Head of Community Engagement and Service Delivery	$200,000.00
Fundraising and Sustainability Manager	$-
Other G&A incl. Contingency	$60,000.00
Case Manager	$240,000.00
Occupational Therapist	$210,000.00
Program Support	$150,000.00
Educational Technician	$120,000.00
Tech Installers	$120,000.00
Help Desk Agent	$120,000.00
TOTAL	$1,527,500.00
Human Resources	
Employer Mgmt Costs - 20%	$192,000.00
TOTAL	$192,000.00
TOTAL COST	**$1,719,500.00**

▲ Table 8-13: Proposed spending—Cost per project: Service delivery

SUSTAINABILITY AND TRANSFERABILITY

Management Team	TOTAL 5-YEAR COST
CEO	$56,250.00
CTO	$75,000.00
Admin	$60,000.00
Marketing and Communications Coordinator	$-
Chief Financial and Operations Officer (CFO)	$90,000.00
Head of Community Engagement and Service Delivery	$-
Other G&A incl. Contingency	$60,000.00
Fundraising and Sustainability Manager	$240,000.00
TOTAL	$581,250.00
Human Resources	
Fringe Benefits - 20%	$48,000.00
TOTAL	$48,000.00
TOTAL COST	**$629,250.00**

▶ Table 8-14: Proposed spending—Cost per project: Sustainability and transferability

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COSTS PER YEAR OVER 5 YEARS

Projected Cost		2019	2020	2021	2022	2023	TOTAL
Cost of management team	CEO * $75,000 contributed in kind by city	$75,000.00	$75,000.00	$75,000.00	$75,000.00	$75,000.00	$375,000.00
	CTO	$150,000.00	$150,000.00	$150,000.00	$150,000.00	$150,000.00	$750,000.00
	Chief Financial and Operations Officer (CFO)	$120,000.00	$120,000.00	$120,000.00	$120,000.00	$120,000.00	$600,000.00
	Admin	$60,000.00	$60,000.00	$60,000.00	$60,000.00	$60,000.00	$300,000.00
	Marketing and Communications Coordinator	$50,000.00	$50,000.00	$50,000.00	$50,000.00	$50,000.00	$250,000.00
	Head of Community Engagement and Service Delivery	$100,000.00	$100,000.00	$100,000.00	$100,000.00	$100,000.00	$500,000.00
	Fundraising and Sustainability Manager	$-	$75,000.00	$75,000.00	$75,000.00	$75,000.00	$300,000.00
Community Engagement	Facilitator and Marketing Support	$-	$90,000.00	$90,000.00	$90,000.00	$90,000.00	$360,000.00
Platform	R&D Manager	$-	$75,000.00	$75,000.00	$75,000.00	$75,000.00	$300,000.00
	Architect	$90,000.00	$90,000.00	$90,000.00	$90,000.00	$90,000.00	$450,000.00
	UI/UX Designer	$65,000.00	$65,000.00	$65,000.00	$65,000.00	$65,000.00	$325,000.00
	Developers/Engineers	$-	$75,000.00	$150,000.00	$150,000.00	$150,000.00	$525,000.00
	Integration Specialists	$-	$65,000.00	$65,000.00	$65,000.00	$130,000.00	$325,000.00
	Quality Assurance and Testing	$-	$-	$50,000.00	$50,000.00	$50,000.00	$150,000.00
	Technical Writers	$-	$-	$65,000.00	$65,000.00	$65,000.00	$195,000.00
	Tech Support	$-	$-	$120,000.00	$120,000.00	$120,000.00	$360,000.00
	Research Partners	$-	$-	$-	$-	$-	$-
Service Delivery	Case Manager	$-	$-	$60,000.00	$60,000.00	$60,000.00	$180,000.00
	Occupational Therapist	$-	$-	$70,000.00	$70,000.00	$70,000.00	$210,000.00
	Program Support	$-	$-	$50,000.00	$50,000.00	$50,000.00	$150,000.00
	Educational Technician	$-	$-	$40,000.00	$40,000.00	$40,000.00	$120,000.00
	Tech Installers	$-	$-	$40,000.00	$40,000.00	$40,000.00	$120,000.00
	Help Desk Agent	$-	$-	$40,000.00	$40,000.00	$40,000.00	$120,000.00
TOTAL Cost of management team		**$710,000.00**	**$1,090,000.00**	**$1,700,000.00**	**$1,700,000.00**	**$1,765,000.00**	**$6,965,000.00**
Cost of human resources	Employer Management Costs - 20%	$111,000.00	$126,000.00	$126,000.00	$126,000.00	$126,000.00	$615,000.00
	Fringe Benefits - 20%	$-	$18,000.00	$78,000.00	$78,000.00	$78,000.00	$252,000.00
TOTAL Human Resources		**$111,000.00**	**$144,000.00**	**$204,000.00**	**$204,000.00**	**$204,000.00**	**$867,000.00**

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COSTS PER YEAR OVER 5 YEARS (cont.)

Projected Cost		2019	2020	2021	2022	2023	TOTAL
Operating Cost	Legal Costs	$20,000.00	$20,000.00	$20,000.00	$20,000.00	$20,000.00	$100,000.00
	IT Systems	$30,000.00	$30,000.00	$30,000.00	$30,000.00	$30,000.00	$150,000.00
	Translation Services	$5,000.00	$5,000.00	$5,000.00	$5,000.00	$5,000.00	$25,000.00
	Privacy Consulting	$25,000.00	$25,000.00	$25,000.00	$25,000.00	$25,000.00	$125,000.00
	Accounting Costs	$35,000.00	$35,000.00	$35,000.00	$35,000.00	$35,000.00	$175,000.00
	Marketing Budget	$10,000.00	$10,000.00	$10,000.00	$10,000.00	$10,000.00	$50,000.00
	Office Space/Centre of Excellence	$-	$-	$60,000.00	$60,000.00	$60,000.00	$180,000.00
	Travel	$25,000.00	$15,000.00	$15,000.00	$15,000.00	$15,000.00	$85,000.00
	Supplies and Equipment	$5,000.00	$5,000.00	$25,000.00	$25,000.00	$25,000.00	$85,000.00
	IT Infrastructure	$15,000.00	$15,000.00	$15,000.00	$15,000.00	$15,000.00	$75,000.00
	Other G&A	$5,000.00	$5,000.00	$25,000.00	$25,000.00	$25,000.00	$85,000.00
	Liability Insurance	$5,000.00	$5,000.00	$50,000.00	$50,000.00	$50,000.00	$160,000.00
	Other/Misc.	$-	$-	$-	$-	$-	$-
	Facilitators	$-	$24,000.00	$24,000.00	$24,000.00	$24,000.00	$96,000.00
	Marketing	$-	$36,000.00	$36,000.00	$36,000.00	$36,000.00	$144,000.00
	IT Equipment	$-	$-	$25,000.00	$25,000.00	$25,000.00	$75,000.00
	Server infrastructure	$-	$-	$75,000.00	$75,000.00	$75,000.00	$225,000.00
	Design Tools	$-	$-	$5,000.00	$5,000.00	$5,000.00	$15,000.00
	Development Tools	$-	$-	$5,000.00	$5,000.00	$5,000.00	$15,000.00
	Testing Tools	$-	$-	$5,000.00	$5,000.00	$5,000.00	$15,000.00
	Documentation Tools	$-	$-	$5,000.00	$5,000.00	$5,000.00	$15,000.00
	Contingency Cost 3%	$60,000.00	$60,000.00	$60,000.00	$60,000.00	$60,000.00	$300,000.00
TOTAL Operating Cost		**$240,000.00**	**$290,000.00**	**$555,000.00**	**$555,000.00**	**$555,000.00**	**$2,195,000.00**
TOTAL		**$1,061,000.00**	**$1,524,000.00**	**$2,459,000.00**	**$2,459,000.00**	**2,524,000.00**	**$10,027,000.00**

Table 8-15: Proposed spending—Detailed financial analysis over five years

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VILLAGE INITIATIVE 5-YEAR PROJECTED FINANCIAL PLAN

	2019	2020	2021	2022	2023	TOTAL
Projected Revenues	$-	$-	$520,000.00	$1,790,000.00	$2,260,000.00	$4,570,000.00
Partner Subsidies, Research Grants, Government Grants, Foundations	$-	$-	$500,000.00	$1,000,000.00	$500,000.00	$2,000,000.00
Smart Device Solution Sales	$-	$-	$-	$720,000.00	$1,440,000.00	$2,160,000.00
Planned Giving	$-	$-	$-	$50,000.00	$50,000.00	$100,000.00
Endowments	$-	$-	$20,000.00	$20,000.00	$20,000.00	$60,000.00
Solution Support Services	$-	$-	$-	$-	$250,000.00	$250,000.00
Projected Expenses	$1,006,900.00	$1,441,900.00	$2,366,900.00	$2,706,900.00	$2,959,400.00	$10,482,000.00
Total Management, Human Resources, and Operating Expenses	$1,002,000.00	$1,437,000.00	$2,362,000.00	$2,357,000.00	$2,437,000.00	$9,595,000.00
Hardware	$-	$-	$-	$300,000.00	$450,000.00	$750,000.00
Assessment Fees	$-	$-	$-	$45,000.00	$67,500.00	$112,500.00
Admin Fees (Planned Giving)	$3,500.00	$3,500.00	$3,500.00	$3,500.00	$3,500.00	$17,500.00
Admin Fees (Endowments)	$1,400.00	$1,400.00	$1,400.00	$1,400.00	$1,400.00	$7,000.00
Net Income	-$1,006,900.00	-$1,441,900.00	-$1,846,900.00	-$916,900.00	-$699,400.00	-$5,912,000.00

PROJECTED FINANCIAL PLAN						
	2019	2020	2021	2022	2023	TOTAL
Projected Expenses	$1,061,000.00	$1,524,000.00	$2,459,000.00	$2,459,000.00	$2,524,000.00	$10,027,000.00
Cost of Management Team	$710,000.00	$1,090,000.00	$1,700,000.00	$1,700,000.00	$1,765,000.00	$6,965,000.00
Cost of Human Resources	$111,000.00	$144,000.00	$204,000.00	$204,000.00	$204,000.00	$867,000.00
Operating Costs	$240,000.00	$290,000.00	$555,000.00	$555,000.00	$555,000.00	$2,195,000.00
Actual Expenses	$-	$-	$-	$-	$-	$-
Cost of Management Team	$-	$-	$-	$-	$-	$-
Cost of Human Resources	$-	$-	$-	$-	$-	$-
Operating Costs	$-	$-	$-	$-	$-	$-

Table 8-16: Proposed spending—Five year projected financial plan

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Chapter 9 IMPLEMENTATION PHASE REQUIREMENTS

Should we be selected as a winner in the Smart Cities Challenge, the City of Côte Saint-Luc intends to work with its existing partners and future partners to identify and meet all regulatory reporting and legislative policy requirements. This chapter outlines our plan with regard to the requirements as outlined in the Finalist Guide.

9.1 DUTY TO CONSULT WITH INDIGENOUS GROUPS

The City of Côte Saint-Luc is located on the island of Montreal, which is situated in Mohawk (Kanien'keha:ka) and Iroquois Territory. The City has already reached out to the Health and Social Services of James Bay (Cree Health Board) to gauge their potential support. The Cree Health Board has shown interest. This will allow us to further offer this program to Indigenous groups and remote communities and involve them in the initial phases of the Initiative. We do not see any potential adverse impact to the Treaty holders in and around our community. On the contrary we see many potential benefits. We have some 40 residents in our community that have self-identified as Indigenous[7]. Should we be selected as a winner, we will reach out to these residents and ask them to participate in the initial phases of implementation if their families and elders see a potential benefit in participation.

9.2 COMMUNITY EMPLOYMENT BENEFIT (CEB)

In compliance with the Community Employment Benefit (CEB) program which applies to the winners of the Smart Cities Challenge, Côte Saint-Luc has already partnered with two organizations that are committed to recruiting and finding employment opportunities for a variety of targeted groups that are included in the CEB program. Both these organizations already collaborate with Côte Saint-Luc in that they directly service our residents with their business counselling and job placement services.

Agence Ometz is a well-established non-profit organization in the west-end of Montreal. It offers a variety of counselling services for job seekers and entrepreneurs. Agence Ometz provides a full range of employment services to special needs job seekers, from skills training to job search assistance. It also offers services for employers to help them find qualified candidates with specialized skills. Agence Ometz also offers coaching for social enterprises and startups including courses on how to start a business and provides services for newcomers to help new arrivals to Montreal establish their lives in Canada through a range of services, from integration activities to employment services. Agence Ometz is accredited by the Ministère de l'Immigration, de la Diversité et de l'Inclusion (Quebec's Ministry of Immigration) to provide these settlement and integration support services to new immigrants. Please see Appendix for letter of support from Agence Ometz.

We have also partnered with **PME Centre-Ouest** which services Côte Saint-Luc and other west-end cities and boroughs on the island of Montreal. This organization is part of a government financed network of offices on the island that offers coaching, training and financing for entrepreneurs, and training and coaching for job seekers.

As a member city that sits on the Governing Board of the PME Centre-Ouest, Côte Saint-Luc has consulted with their advisors about the Smart Cities proposal and is in close contact with their counsellors and advisors who will be able to direct potential candidates to the VillAGE Initiative.

Once the VillAGE Initiative is launched we will work with these two organizations in order to meet the requirements of the CEB program. In particular we will:

- Focus on recruiting new immigrants who are often skilled technicians and very well suited to learn how to install and develop smart home devices for seniors;
- Target youth for a variety of employment opportunities, especially in the technology domain and service delivery;
- In our contracts for procurement of services, we will give first consideration to social enterprises.

[7] Profil Sociodemographique, 2016, http://ville.montreal.qc.ca/pls/portal/url/ITEM/538113131BC71046E0530A9301321046

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Women already represent a majority of Côte Saint-Luc city management and are planned to have a significant role in the VillAGE Initiative non-profit organization as well. We are therefore not focused on affirmative action for women, however we will continue to recruit new staff and employees without any gender bias.

9.3 CLIMATE LENS ASSESSMENT (CLA)

Whereas the VillAGE Initiative does not deal directly with greenhouse gas mitigation or climate change adaptation, there is no obligation or relevance on our part to undertake GHG mitigation assessment, or the climate change resilience assessment to respond to climate change related disruption or impact. However we would simply add that over the long term our project aims to implement environmental monitoring into the connected network linking seniors to city and social health services. Once deployed these environmental sensors for temperature and air quality will give us better indication of the impact of air pollution and extremes in weather, which would inform our policies and programs regarding GHG reduction and climate change resilience.

9.4 OTHER APPLICABLE LAWS, REGULATIONS, AND POLICIES

Managed by the Société d'habitation du Québec, the Programme d'adaptation de domicile (PAD) provides financial support for the home adaptation projects for people with disabilities. The goal is to allow people with physical disabilities to enter and exit their home, perform their daily routines, and therefore continue to reside in their own home more safely and securely. Financial assistance may be as much as $16,000 per eligible person. The admissible work is determined by the municipal partner based on the terms of the program and the recommendations made by staff from the Local community services centres (CLSC), which often takes months of waiting, or costs residents out of pocket for a private occupational therapist. We will expedite the process by providing home assessment as one of the services offered by the VillAGE Initiative. This assessment will be performed by an occupational therapist that we will have on staff. This is, in fact, part of our mandate as we already are partners in the PAD program. In addition, the City of Côte Saint-Luc will ask the Société d'habitation du Québec (SHQ) to include technological devices such as sensors as part of the program, as they are just as useful and important for safety and security as bars and physical adaptation tools.

9.5 RISKS AND MITIGATION MEASURES

Risk	Risk Mitigation Plan
Indigenous population in Côte Saint-Luc not known, difficult to find, potentially reluctant to engage with the City.	• Make strong attempts through social media and print media to specifically invite Indigenous residents to a focus group. • Contact Mohawk Nation for community consultation.
As the population being served is vulnerable, this raises issues regarding the quality of service delivery people going into their homes.	• Do police checks on all hires. • Create language and use personality tests for service delivery people and ensure that employees receive customer service training related to seniors. • Create a training program for technical skills, since many of the technologies that will be applied are new. • Ensure that each service delivery person receives intensive training on VillAGE privacy policies.
The Societe d'habitation du Québec (SHQ) may refuse to expand the PAD program to include smart home devices, reducing accessibility of VillAGE services.	• Obtain letters of support that document the health and importance of the tech tools from our health and research partners and present them to the SHQ. • Produce a cost benefit analysis showing value of VillAGE as it reduces costs for government health and social services. • If necessary, create public awareness campaign related to this.

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Reimagining Our Shared Mobility Future

March 2019

















SOUTH ISLAND
PROSPERITY
PARTNERSHIP

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APPENDICES
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We are grateful to be doing our work on the territories of the Coast Salish and Nuu-chah-nulth peoples, known today as Lkwungen peoples (Esquimalt and Songhees Nations), W̱SÁNEĆ Nation (consisting of SṮÁUTW̱–Tsawout, BOḴEĆEN – Pauquachin, W̱ JOŁEŁP – Tsartlip, and W̱SIḴEM – Tseycum Nations), Sc'ianew Nation (Beecher Bay), T'Sou-ke Nation, and Pacheedaht Nation. We respect and, in partnership, build on the traditional knowledge of the Indigenous peoples who have thrived and prospered in the South Island for millennia.

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Glossary of Key Terms

Co-design target groups:
The three priority populations for the Smart Mobility Program

- Seniors
- Indigenous students
- New employees

Indigenous Smart Mobility Pilot:
Mobility as a Service pilot project for Indigenous students

Initial proposal:
SIPP's first submission to the Smart Cities challenge

Mobility Wellness Index (MWI):
A unique performance tool SIPP developed to measure impacts on people's physical, emotional and financial wellness resulting from mobility improvements

Program Management Office (PMO):
The entity charged with managing the Smart Mobility Program

Scaled Agile Framework (SAFe):
Project management model adopted for delivering the Smart Mobility Program

Smart Mobility Program (SMP):
Overarching program comprising our three projects

- Project 1: Integrated Mobility as a Service (MaaS)
- Project 2: Smart Trip Planning and Single Payment Platform (STP)
- Project 3: Smart South Island Inspiration Centre (SSIIC)

South Island Prosperity Partnership (SIPP):
A private not-for-profit organization that serves as the economic body for Greater Victoria and the entity submitting this Smart Cities Challenge application

Stage Gates:
Project phases, defined by key milestones in program delivery and evaluation

- Stage Gate 1: Minimum Viable Product / Pilot
- Stage Gate 2: Iterative Development
- Stage Gate 3: Rollout
- Stage Gate 4: Operate and Scale (post-SCC)

Acronyms:

API: Application Programming Interface

CIO: Chief Information Officer

CTO: Chief Technology Officer

KPI: Key Performance Indicator

MaaS: Mobility as a Service

MFA: Multifactor Authentication

MWI: Mobility Wellness Index

MVP: Minimal Viable Product

NFP: Not-for-Profit organization

P3: Public-Private Partnership

PII: Personally Identifiable Information

PIPA: Personal Information Privacy Act

PMO: Program Management Office

SAFe: Scaled Agile Framework

SCC: Smart Cities Challenge

SIPP: South Island Prosperity Partnership

SMP: Smart Mobility Program

STP: Smart Trip Planning and Single Payment Platform

SSIIC: Smart South Island Inspiration Centre

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Executive Summary
Canada's Smart Cities Challenge



Aerial view of Fort Street and Cook Street, Victoria

Greater Victoria is proud to be united behind a vision for a new, shared mobility future that is convenient, green, affordable, inclusive and improves the prosperity and wellbeing of its citizens. Our vision will be achieved by using smart city technologies, but also by bringing our tagline "Citizen-Inspired Transformation" to life, so that our communities and many others across Canada can realize the benefits of improved mobility.

We are grateful for the support and contributions of our 117 partners, including 13 funding partners, six program partners, 14 funded development and research partners and 84 collaborative partners. This proposal has—without a doubt— been made infinitely better through their participation and involvement. Our momentum and collective will to solve our pressing mobility challenges has never been stronger.

With our rich array of partners, our governance model, our commitment to outcomes that matter to our citizens, and our measured implementation approach, we will not only ensure that our projects are well-executed but also that they are meaningful and transformative to our region and Canada.

It is with pleasure that the South Island Prosperity Partnership (SIPP) shares its vision and implementation plan for a Smart Mobility Program (SMP) in the forthcoming chapters.

REIMAGINING OUR SHARED MOBILITY FUTURE

Through Canada's Smart Cities Challenge, we will showcase how smart mobility can be a local and global model—through connected and innovative technologies that are co-designed by our citizens to ensure everyone enjoys the "freedom to move." Our guiding challenge statement is:

> "To achieve each person's "freedom to move," we will collaboratively create a multimodal transportation network that is convenient, green, and affordable, which will boost South Islanders' mobility wellbeing score by at least 20%."

Our Smart Mobility Program (SMP) is comprised of three ambitious projects designed to not only achieve our vision, but be scaled elsewhere. These are measured through our five key outcome themes, detailed on page 7.

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- PROJECT 1 – Delivery of Integrated Mobility as a Service (MaaS)
- PROJECT 2 – Smart Trip Planning and Universal Payment Scheme (STP)
- PROJECT 3 – Smart South Island Inspiration Centre (SSIIC)

This proposal is directly guided by the needs, aspirations and wisdom of our citizens. It reflects SIPP's ongoing pledge to advance "Citizen-Inspired Transformation" throughout Greater Victoria. Leading up to this proposal, SIPP facilitated over two years of resident and stakeholder engagement culminating in Vision 2040, a regional roadmap to guide how connected technologies and data should be used to improve our lives and community wellbeing.

Our SMP reflects mobility priorities identified by citizens in Vision 2040, and provides an innovative blueprint for how our communities, provincially and nationally, can leverage smart technologies to achieve meaningful social, economic, health and environmental outcomes.

SOLVING CRITICAL CHALLENGES

At a high level, our vision addresses the most critical challenges faced by many cities across the world: rising unaffordability, aging populations, and climate change in the context of population growth, decaying infrastructure and fractured governance systems.

Our SMP takes this down to the citizen level by linking one particular solution—mobility freedom—to these challenges. An aging population means increased social isolation. Rising unaffordability means vulnerable populations move farther away from the economic base they need to thrive. Climate change means the personal automobile is no longer an acceptable option for everyone in the long-term. Fractured governance means coordinating solutions to these problems—in ways that are inclusive and effective—are more difficult.

Improving our collective access to mobility freedom, starting with our most vulnerable populations, is a journey to achieving broad economic, social and environmental outcomes.



Bike lanes and bike racks in downtown Victoria

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A CULTURE OF COLLABORATION

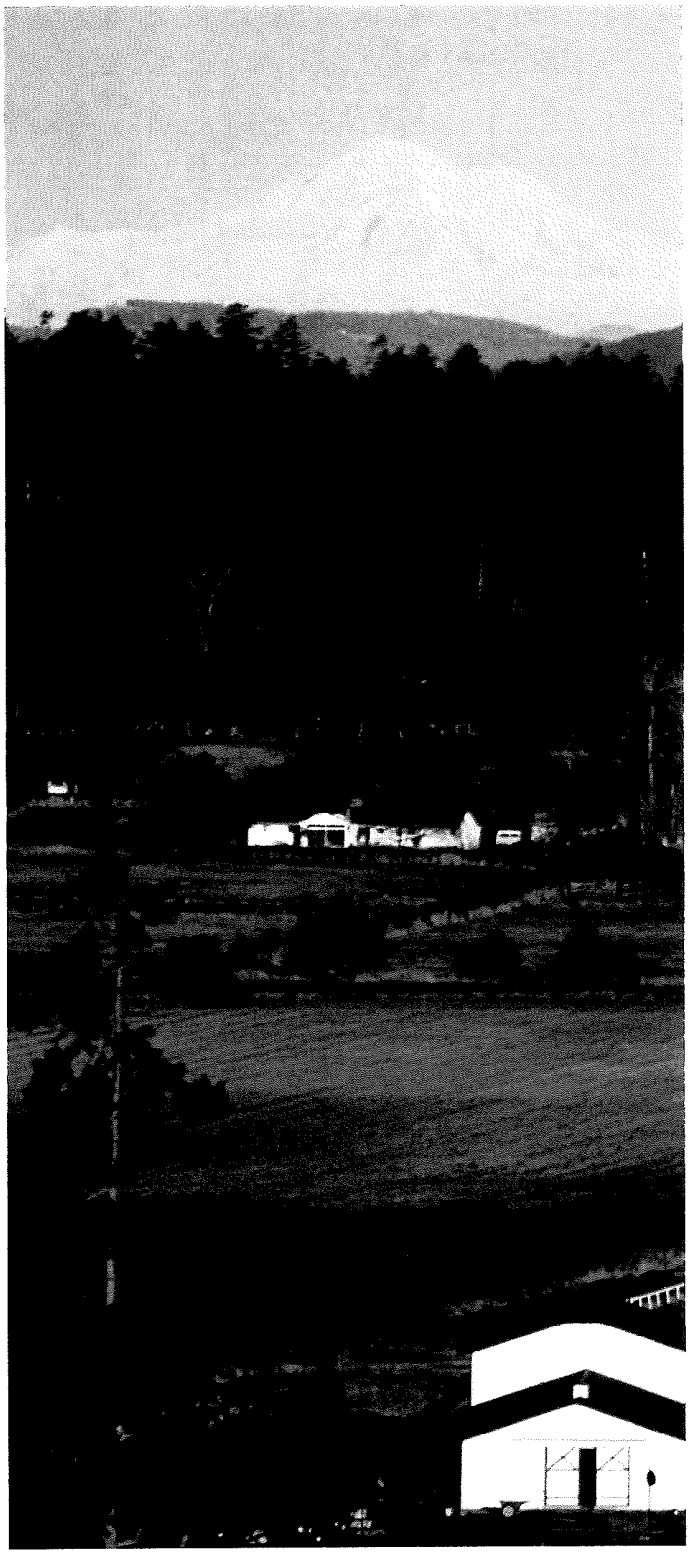
Founded in 2016, SIPP is a public-private partnership designed to engage governments, businesses, institutions, industry associations and nonprofits toward a sustainable regional economy. SIPP membership comprises 10 municipal governments, seven First Nations communities, three post-secondary institutions, seven industry associations and nonprofits, and 24 large employers. Our unique governance approach aligns closely with the Smart Cities Challenge approach, promoting openness, integration, transferability, and collaboration.

To reflect our steadfast commitment to collaboration, our name has been updated from the South Island Prosperity Project, in our initial SCC proposal, to the current South Island Prosperity Partnership. SIPP's diverse and inclusive membership is critical to the development and successful implementation of our SMP and also makes us resilient by never being reliant on a single partner.

WHY SHOULD WE WIN?

Our vision chapter captures our commitment to deliver truly transformative change through our SMP mobility improvements. This is evidenced by swift, well-coordinated implementation and delivery, and rich engagement through our co-design process with key targeted populations. Our project management model and outcome-based feedback loop will provide the quick wins required to build momentum. SIPP's policy framework for data privacy and security will be central to maintaining data integrity for the public and our partners, while also providing guidelines for selecting the smart technologies we employ to deliver transformative change.

Our solutions are designed not only to be innovative, by integrating mobility, data and connected technologies, but also highly exportable ideas that can solve the mobility needs of Greater Victoria and beyond. Our ideas and outcomes alike will be shared with our regional, national and international partners in hopes that our successes will be modelled and scaled elsewhere.



Saanich landscape

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OUTCOMES-FOCUSED IMPLEMENTATION

We will measure our progress and success against these five outcome statements, which were identified through community consultation and stakeholder engagement. These outcomes are also captured in a highly engaging and public-facing tool we developed called the Mobility Wellness Index, the first of its kind in Canada.



Convenience: With more convenient, accessible multimodal transportation options enabled by smart technology, residents with access to convenient alternatives to single occupancy vehicles will increase by at least 20% by 2024.



Affordability: With improved multimodal transportation options and trip planning enabled by smart technology, residents will spend, on average, less than 10% of their annual household incomes on transportation.



Wellbeing: With multimodal transportation options and planning enabled by smart technology, the number of daily trips made by active and healthy travel modes (i.e., walking, transit, cycling) will double by 2024 over the current baseline, and average levels of reported trip satisfaction in the region will rise 10%.



Green: Due to shifts in number of per capita daily trips taken with personal automobiles towards daily trips per capita taken with alternative travel modes, per capita vehicle fuel consumption will decrease by 15% by 2024.



Inclusivity: As a result of improved and more integrated multimodal transportation options and trip planning enabled by smart technology, 20% more low-income residents will report improved access to their places of education, services and/or employment by 2024.

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PROPOSAL PREVIEW

Our proposal is designed to first share **what** our vision for a smart mobility future looks like in Chapters 1–2, followed by **who** will be leading and engaged in the implementation plan in Chapters 3–4, and finally **how** we will implement it and achieve our stated outcomes in Chapters 5–8. Appendices follow, which encompass our Finance Chapter and documents supporting our submission.

- **Chapter 1 – Vision**: Our shared vision, co-design target groups, user journeys and win themes
- **Chapter 2 – Technology**: Our SMP project and technology plan details, compliance and standards, risk mitigation, linkages to outcomes
- **Chapter 3 – Governance**: Our unique SIPP and SMP governance frameworks, partnerships, and oversight, risk mitigation, linkages to outcomes
- **Chapter 4 – Engagement**: Our deep engagement to date, key findings, engagement plan for implementation phase, diversity and inclusion framework, risk mitigation, linkages to outcomes
- **Chapter 5 – Data and Privacy**: Our validated data approach, sources, data and privacy plans and compliance, risk mitigation, linkages to outcomes
- **Chapter 6 – Project Management**: Our Scaled Agile Framework, outcomes-based feedback loop, work plan strategy and schedule, core team and stakeholders, procurement plan, future-proofing, risk mitigation, linkages to outcomes
- **Chapter 7 – Performance Measurement**: Our outcome-based performance measurement framework, reveal of the Mobility Wellness Index, monitoring and evaluation plan, risk mitigation, linkages to outcomes
- **Chapter 8 – Implementation Phase Requirements**: Our reporting and legal requirements, risk mitigation, linkages to outcomes
- **Appendices**
  - Appendix 1: Finance Chapter
  - Appendix 2: Privacy Impact Assessment
  - Appendix 3: Letters of Support
  - Appendix 4: Confidential Annex

CONCLUSION

The time to do something about our mounting mobility challenges is now. For the first time in its history, our region is unified around a common goal. The Smart Cities Challenge is critical to bring this concept to reality for our citizens and, more importantly, the vulnerable populations who are being left out of our region's and Canada's collective prosperity.

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CHAPTER 1
Vision

"Vision without action is merely a dream. Action without vision just passes the time. Vision with action can change the world."
– Joel A. Barker

1.1 GREATER VICTORIA AT A CROSSROADS

Across the globe, mobility choices touch every aspect of life: from where we live and how we access services and education, to where we work, our quality of life and wellbeing. Simply put, mobility choices give us freedom; or, conversely, a lack of mobility choice restricts that freedom and has a profound impact on how our lives are shaped. To address this complex issue, Greater Victoria is moving full steam ahead toward a new Shared Mobility future. But what does that mean, and how will this bridge a way forward for all Canadians?

Imagine a young Indigenous student hitchhiking to college or, in an emergency, spending half of his monthly income to take a taxi ride into town. Imagine a senior on a fixed income living in isolation because she can no longer drive. Imagine a new employee who recently relocated to Greater Victoria trying to establish himself, struggling to find affordable housing close to transit so that he can spend more time with his family and less time commuting. These are just a few of the compelling stories we heard from our community—stories that will be familiar to all Canadians.

Every year it gets harder for many Canadians to preserve our high quality of life: today's commutes are longer; traffic congestion and our dependence on personal vehicles is increasing; cities are sprawling, and housing costs are soaring. Meanwhile, those on the periphery—seniors, Indigenous people, persons with disabilities, minorities, immigrants and low-income families—struggle to access the mobility services that would improve their quality of life.[1]

Greater Victoria is at a crossroads. With rising unaffordability, rapid population growth, overlapping jurisdictions and mandates and constrained and aging infrastructure, we face imminent challenges. But there is good news. We have also never before in history had access to so many innovative approaches to solving our citizen's challenges through the use of new technologies, data and digital infrastructure.

Now is the time to make community investments in digital infrastructure that scales and will help all Canadian communities design their own transformative 21st-century mobility solutions

Emboldened by Canada's Smart Cities Challenge, Greater Victoria and its vast network of public and private partners is ambitiously reimagining a new, shared mobility future for all of Canada: a future where our citizens—of all ages, abilities and means —are empowered with the "freedom to move."

1.2 A SHARED VISION FOR SMART MOBILITY

Our vision for Greater Victoria is a shared mobility future that is convenient, green, affordable, inclusive and improves the prosperity and wellbeing of our citizens. SIPP's tagline "Citizen-Inspired Transformation" is the foundation of our vision for a new mobility future in Greater Victoria that is designed by and for people, and provides an innovative blueprint for how our communities —in British Columbia and across Canada—can realize the benefits of improved transport, social and economic mobility. Driven by our vision and aspirations for Greater Victoria's mobility future, our Smart Cities Challenge Statement presented in the initial proposal is as follows:

"To achieve each person's "freedom to move," we will collaboratively create a multimodal transportation network that is convenient, green, and affordable, which will boost South Islanders' mobility wellbeing score by at least 20%."

We will measure our progress toward our challenge statement in five key outcome themes identified through community and stakeholder consultation and engagement: (1) convenience, (2) affordability, (3) wellbeing, (4) green and (5) inclusivity. Since our initial proposal, we have added an 'inclusivity'

1 Assessing and Measuring the Factors affecting Mobility, Transportation Accessibility and Social Need, research report by University of Toronto for Metrolinx, http://www.metrolinx.com/en/regionalplanning/rtp/research/Assessing_and_Measuring_the_Factors_Affecting_Mobility_Transportation_Accessibility_and_Social_Need.pdf

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outcome to underscore that our solutions must
ility, inclusivity and diversity.
ents, baselines, indicators, and a
evaluation plan for each outcome are
apter 7, including the development of
Mobility Wellness Index (MWI).

ool we have designed to meaningfully
cts that mobility systems have on
al, emotional and economic wellbeing.
e American Public Transportation Association (2017), vulnerable populations (e.g. women, low-income persons, seniors, new immigrants, persons with disabilities) are most reliant on public transportation. However, more research is needed to show that these populations are also more vulnerable to first-mile/last-mile challenges. With a focus on inclusive outcomes, our research will help address this knowledge gap. The MWI is designed to be scalable and replicable to other towns and cities across Canada and the world —we are currently in dialogue with Montreal (Canada), Perth (Australia) and Columbus (USA) about its applicability to other regions.

We will maintain our commitment to making progress on our challenge and outcome statements, as we have systematically aligned our Smart Mobility Program (SMP) and three major Projects to our data and technology plans, governance and evaluation, citizen engagement processes, project management and payment schedule — all carefully woven together in a performance piloting/testing and iterative investments from SMP stakeholders. This systems-based approach reduces the risk that the program strays from its original vision and is described in detail throughout the entirety of this proposal.



U-bike on electric bus at Smart Mobility Expo (October 2018)

1.3 OUR SMART MOBILITY PROGRAM

Our SMP is comprised of our three projects, designed to address Greater Victoria's mobility needs, and achieve our vision by measuring success through our five key outcome themes noted above. During the finalist phase, we have advanced design and engagement for our Projects by refining their direction and focus and solidifying the strong links and dependencies among the three projects, which are outlined below:

PROJECT 1 – INTEGRATED MOBILITY AS A SERVICE (MAAS)

Mobility as a Service (MaaS) represents an innovative shift from a personal vehicle ownership model to mobility solutions that are consumed as a service. Bringing all available modes of transportation together into a single, centralized technology platform enables this shift into a new mobility future, particularly for the user. MaaS focuses on moving people, not vehicles, and is gaining traction globally.

PROJECT 2 – SMART TRIP PLANNING AND UNIVERSAL PAYMENT PLATFORM (STP)

While Project 1 is the platform to bring people, communities, schools and employment opportunities together with a broader range of transportation options, Project 2 is the tool to make those mobility services convenient. This project is critical for improving multimodal adoption rates. This trip planner serves as the interface between the end user and the MaaS platform. It will be a seamless, universal payment system for all the region's mobility services.

PROJECT 3 – SMART SOUTH ISLAND INSPIRATION CENTRE (SSIIC)

Our vision is that the SSIIC will start initially as a digital platform to host transportation data from multiple sources and operators into a single, usable platform. This platform is essential in the development of the digital ecosystem that enables third parties to scale the delivery of MaaS and trip planning and payment applications. Our intention is for this digital platform to evolve over time into a physical, interactive mobility lab dedicated to collaboration, education, and innovation through advanced analytics and data simulation.

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1.4 BRINGING "CITIZEN-INSPIRED TRANSFORMATION" TO LIFE

SIPP's greatest strength as an organization and regional voice is its proven ability to unlock the exponential power of collaboration. Over the past two years, SIPP has become a key leader and facilitator of the smart mobility transformation in our region. Our early engagement process (leading up to our initial proposal) culminated with Vision 2040, our long-term vision to address major regional challenges across five key themes—environmental health, human health, economic resilience, transportation and mobility, and affordability. From this list, citizens, businesses, civil society groups and local leadership identified transportation and mobility as the single-most important priority to address today.

Since being selected as a finalist in Canada's Smart Cities Challenge (SCC), we have learned a lot about our fellow citizens—how mobility impacts their needs, aspirations, challenges and hopes for the future. We have now met with hundreds of citizens and stakeholders in Greater Victoria, and engaged indirectly with thousands more through surveys, campaigns and online impressions. These engagement insights, described in Chapter 2, directly informed our SMP.

1.5 CO-DESIGN TARGET GROUPS

Vision 2040 and our ongoing engagement continues to frame our approach to the projects within our SMP, which are detailed in Chapter 2. In order to test our projects, we identified three population groups facing the most pressing challenges in Greater Victoria and across the country. Our first set of co-design target groups consist of Indigenous students, seniors, and new employees. We detail these groups and profile individual users on page 13.

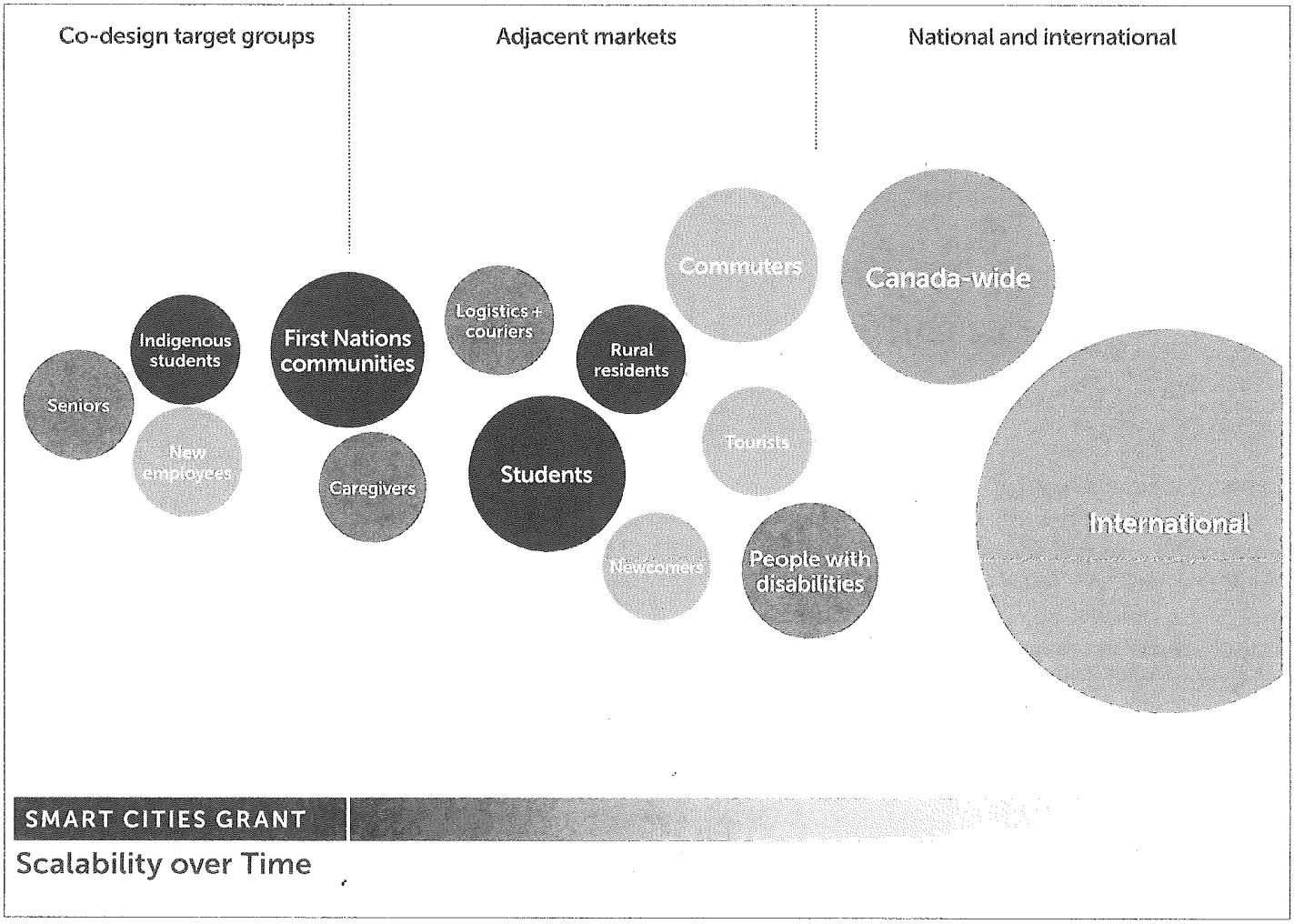


Figure 1.1: Scalability of projects

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These groups share similar characteristics and mobility needs with additional population sub-sets (e.g. low-income, language minorities, rural/remote, caregivers, accessibility-challenged, etc.). Insights derived from our co-design target groups are intended to help inform services, refinements and innovation that can be used to design and scale mobility solutions for new markets with similar characteristics as shown in Figure 1.1. Over time, these solutions can scale across the broader population of Greater Victoria to achieve our challenge statement and Vision 2040 goals.

The significance of the SMP spans far beyond the co-design target groups. We expect to take our learning to extend the program to other non-emergency mobility needs of the wider Greater Victoria region to improve efficiencies, availability and the range of transit services by scaling to new local markets, rural communities across the province and, more widely, across Canada.

INDIGENOUS STUDENTS

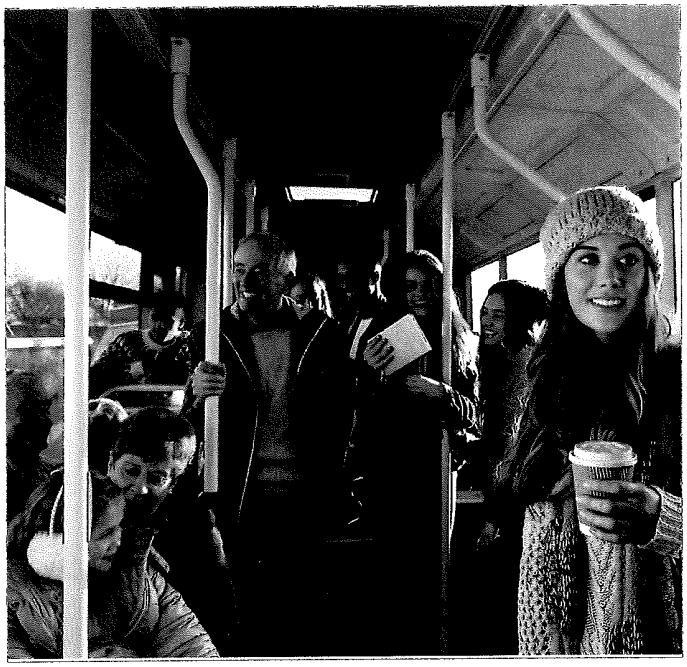
Greater Victoria is home to 10 First Nations communities, most of which have poor geographic connections to the wider community and economic centres, making it challenging to access education, services and employment. For Indigenous students, poor transit reliability and misaligned scheduling of existing transit service is a significant barrier that dramatically impacts their ability to access educational opportunities,[2] and often forces students to hitchhike or walk along hazardous roads in unsafe conditions.

SENIORS

Greater Victoria is home to the largest percentage of seniors of any large urban area in Canada, and demographic projections show that Canada's senior population will be 23–25% of our total population by 2036. In order to age in place, mobility-limited seniors need convenient, accessible and affordable transportation,[3] both to meet their daily needs and to mitigate the risk of isolation and loneliness and the accompanying mental health impacts.[4] Without change, this causes a social and economic cost to the country, approximately $390 million annually for the public cost of home care for seniors with mobility restrictions.[5] Though particularly acute in Greater Victoria, this issue is prevalent across the country.

NEW EMPLOYEES

Greater Victoria's economy is strong, and there are a number of important, large employers in our region who are regularly recruiting. They want and need to attract high-quality employees, yet high housing costs and limited transportation options are often a deterrent. For newcomers, it is recognized that sustainable and affordable transportation choices are most easily established if they are part of a housing choice. This problem stretches beyond talent retention for employers and is applicable to new employees, new students and overall, new residents.



Broadening multimodal options that meet the diverse needs of Greater Victoria residents

2 According to Canada's Auditor General, the education gap for those living on reserve has widened over the last 15 years, http://www.oag-bvg.gc.ca/internet/English/parl_oag_201805_05_e_43037.html

3 According to Government of Canada over one third of Canadians ages 65 and older are living with a disability (and over 42.5% among individuals aged 75 and up), https://www.canada.ca/content/dam/nsc-cna/documents/pdf/policy-and-program-development/publications-reports/2014/Report_on_the_Social_Isolation_of_Seniors.pdf

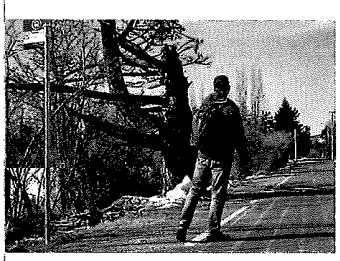
4 According to Government of Canada social isolation is a predictor of mortality from coronary heart disease/stroke to cognitive decline, https://www.canada.ca/content/dam/nsc-cna/documents/pdf/policy-and-program-development/publications-reports/2014/Report_on_the_Social_Isolation_of_Seniors.pdf

5 See Accessible Transit in Canada: Building on the Benefits. Report by the Canadian Urban Transit Association, http://cutaactu.ca/sites/default/files/cutareport_valuecaseforaccessibletransitincanada.pdf

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INDIGENOUS STUDENT USER JOURNEY : JARID

Jarid, aged 23, is a post-secondary student who lives on a remote First Nations reserve that is not well-served by transit. If he misses the infrequent bus he misses his class entirely, or worse, his exams. Missing classes due to poor transit access is detrimental to Jarid's education. A missed bus means being stranded for hours and lost opportunities. Having access to reliable, consistent on-demand transit is critical to Jarid's educational success and progress.



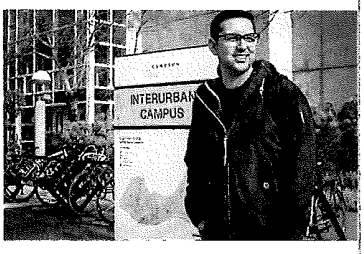
Jarid is taking transit to school for an exam. He realizes he missed the bus. The next bus arrives in an hour.



Jarid texts the Indigenous SMP text service for a backup ride to get him to school.



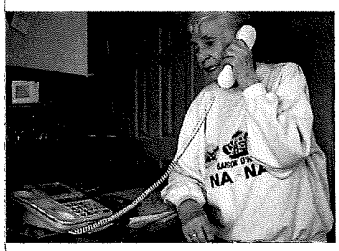
A First Nations community vehicle is sent to pick up Jarid for a ride to school.



Jarid arrives at school in time for his exam.

SENIOR USER JOURNEY : JACKIE

Jackie, age 91, lives alone in a condo just outside the urban core. She is blind but still very active and sharp. Living independently is important to Jackie, but she can only maintain her independence with carefully considered pre-planning. Accessible transit is critical to her quality of life and allows her to age in place—without it, Jackie would be isolated. Access to transit that serves Jackie's needs enhances her quality of life and keeps her connected to her community and family.



Jackie talks to the Smart Mobility Program help line to plan her travel for the week.



With their help, Jackie knows which bus route to take into town for her activities.



Jackie meets with her family in town at the local café for an afternoon snack and visit.



Jackie walks with her family to her medical appointment later that day.

NEW EMPLOYEE USER JOURNEY : NEIL

Neil, aged 30, is new to Greater Victoria. He recently immigrated from India and has accepted a job in the urban core. Neil doesn't have a vehicle and lives far outside the core, so he had difficulty figuring out the first/last mile of his new commute. The availability of multimodal options, like bike share, means Neil's commute is easier, convenient and affordable.



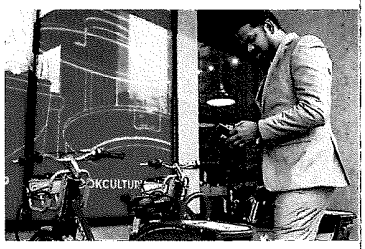
Neil has recently moved to Victoria and has been offered a new job in the city.



Neil does not own a car. He wants to know the best ways to travel and explore Victoria.



Through his new employer, Neil has access to the Smart Mobility Program app that connects him to the local bikeshare.



With the app, he can easily find, book and pay for a bike for his trips in the city.

Figure 1.2: User Journeys

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1.6 WHY SHOULD WE WIN?

We have a head start on our challenge and engagement – A fundamental commitment to co-design and citizen engagement, and strong relationships built over time, have given us the insight, engagement and momentum to deliver results quickly. Not only have we tapped the innovation capacity of our community through open innovation challenges, we learned a tremendous amount that informs our SMP and implementation plan, enabling us to transition to a higher gear faster.

We have committed partners – We have received significant support and in-kind commitments from partners as evidenced in our partnership matrix and our 117 letters of support (Appendix 3). We have four partners categories: funding, program, funded development and research and collaborative, detailed further in Chapter 3. These partners cover a wide spectrum from engagement, citizens and civil society, to industry, and local government. We also have strong planning and implementation support from anchor partners like BC Transit and CUTA (Canadian Urban Transit Association).

We are focused on accessibility, diversity and inclusion – Our proposal engages directly with seven First Nations communities to co-design mobility options that will better serve Indigenous peoples and First Nations communities. Specifically, we will work with Indigenous students to improve accessibility that provides greater connections to educational and work opportunities, as well as improves social and economic inclusion. Our projects are designed to make impactful strides in improving convenience and accessibility for users with a wide range of mobility needs, and our co-design process will ensure a wide spectrum of voices help to shape and implement our SMP.

Indigenous Smart Mobility Pilot – Through extensive research and engagement with First Nations communities, education facilities such as Camosun College and Saanich Adult Education Centre (SAEC), BC Transit and other partners, we have been able to secure vehicle assets, drivers and training support to make the Indigenous Smart Mobility Pilot possible.

We are the ideal Canadian test market – Greater Victoria offers visibility as the Capital Region of British Columbia. We rank 15th out of 34 Census Metropolitan Areas in population and therefore are an optimal mid-size, smart city test-bed. The size of our region, and its rural and urban environments, means we will produce solutions that can be demonstrated, tested, delivered and refined to solve a variety of our region's and our country's challenges.

We are already delivering and scaling – The Mobility Wellness Index funded by the finalist grant is a collaborative tool and will soon be shared with many cities to track regional and national progress across a consistent set of indicators. This tool is now ready for use, and we have already developed strong interest from smart city peers like Montreal (Canada), Columbus (USA), and Perth (Australia) to apply the Index to their unique context.

We have the right governance – Globally, the biggest challenge to solving urban problems and delivering infrastructure and services is governance. We are guided by the belief that meaningful collaboration draws on the strengths of each partner and will deliver better outcomes than one partner can achieve on their own. As the only public-private partnership (P3) in the SCC, SIPP is uniquely positioned as an independent, trusted organization with a proven capacity and commitment to "Citizen-Inspired Transformation".



Student from SIPP s Future Innovator Challenge at University of Victoria

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We are trusted and independent – SIPP is not beholden to one technology or technology provider. Rather we will ensure open technologies will be favoured in all procurement activities. By removing any specific vendor requirements in our architectures from the outset, we maximize the flexibility and transferability of our solutions. While we will work with leading-edge experts, we actively preserved our independence throughout the development of our proposal to ensure that our community maintains autonomy and control over program outcomes.

We have early recognition – Within a short span of time, SIPP's smart city initiatives, as well as our governance model, are becoming globally recognized. SIPP was a top-five finalist at the Smart City Expo World Congress in Barcelona in the "Governance and Finance" category, recognized out of 473 entries for best-in-class collaborative governance. For the first time, the Intelligent Community Forum (ICF) in New York listed Greater Victoria as a 2019 Smart21 City, an annual list of the world's top cities that are actively participating in the broadband economy.

We have enthusiasm and momentum on our side – Community buy-in is at an all-time high, and the necessary players are at the table for the first time. Where we recently had silos, we now have the collective belief that our shared vision will become a reality. We are ready to show Canada that Greater Victoria is a smart community!



Some collaborative partners at SIPP's Transportation and Mobility Stakeholder Roundtable

CHAPTER 1 LINKAGES TO OUTCOME THEMES

Convenience
STP makes different mobility options convenient to access

Seniors will be provided with convenient transportation needs to mitigate isolation

Affordability
Improved transit will make finding affordable housing easier to access

Students have affordable alternative transit options

Wellbeing
Better transit options improves citizens' physical, emotional and economic wellbeing measured by the MWI

Better transit services mitigate isolation among seniors

Green
MaaS focuses on moving people, not vehicles

Vision 2040 will address and monitor environmental health

Inclusivity
Better accessibility improves connection to educational and work opportunities, improves social and economic inclusion

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CHAPTER 2
Technology

"Sustainable solutions based on innovation can create a more resilient world only if that innovation is focused on the health and wellbeing of its inhabitants. And it is where technology and human needs intersect—that we will find meaningful innovation."

– Frans van Houten

2.1 TECHNOLOGY PLAN FOR OUR SMP

Technology will be developed and delivered through our three projects to address pressing mobility needs by engaging smart technology and our smart citizens—in tandem—to achieve our "freedom to move" vision. We will measure success through our five key outcome themes (Chapter 1).

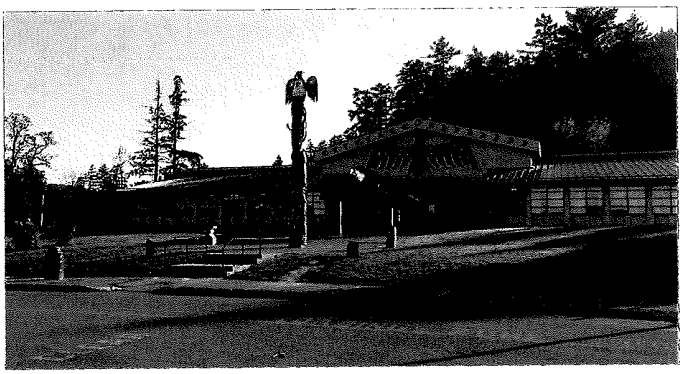
During the finalist phase, we have advanced design and engagement for our projects—refining their direction and focus and solidifying the strong linkage and dependencies among the three projects outlined below.

These projects are vehicles for improving our citizens' wellbeing and for helping us achieve measurable progress toward our challenge statement to create a multimodal transportation network that is convenient, green, and affordable, boosting South Islanders' mobility wellbeing score by at least 20%.

2.1.1 PROJECT 1 – DELIVERY OF INTEGRATED MOBILITY AS A SERVICE

Mobility as a Service (MaaS) is central to our proposal approach and our vision for a new mobility future. MaaS represents an innovative shift from a personal vehicle ownership model to mobility solutions that are consumed as a service. Bringing all available modes of transportation together into a single, centralized technology platform enables this shift into a new mobility future, particularly for the user. MaaS focuses on moving people, not cars, and is gaining traction globally.

Our initial demonstration for this project will be the Indigenous Smart Mobility Pilot. During our engagement with First Nations communities, we have heard that challenges related to service availability, reliability, safety, cost of travel and a lack of awareness of service options are resulting in students, parents and local bands having to develop and operate their own ad-hoc mobility options.



The ŁÁU, WELṈEW Tribal School, part of the W̱SÁNEĆ School Board. All 10 First Nations in the region require reliable access to school.

The Indigenous Smart Mobility Pilot will offer flexible, on-demand microtransit service for 150-200 students across First Nations communities. It will leverage the deployment of existing community-owned or community-run vehicles in a more efficient and coordinated manner. Through several meetings with First Nations communities, we were able to assess the availability of community-owned vehicle assets and drivers, which could be engaged to achieve this MaaS pilot (see Chapter 6 for details on infrastructure readiness). We have gained significant buy-in for this concept by First Nations communities, and this level of collaboration should not be understated as it is critical to our success.

Over time, this pilot will scale to provide more flexible and on-demand mobility services within First Nations communities (for example, non-emergency medical transport services). All customer-facing elements of MaaS must look, feel and have functionality that users want and need. We will develop these through a co-design process with our three co-design target groups. These will be provided, and enforced against a common library of tools, APIs and data standards.

In developing our MaaS concept, we drew from experts who have deployed MaaS pilots in commercial settings around the world. We learned from the

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Canadian Urban Transit Association (CUTA). This helped inform not only our vision, but also our engagement, co-design process and implementation plan focusing on high-needs groups. We can quickly deliver pilots that can be replicated for other geographies and groups. Through the implementation of MaaS, we can also offer insights on how to improve efficiencies and expand service options for seniors and people with disabilities (e.g. BC Transit and handyDART). We expect this MaaS approach to be flexible, on-demand mobility that will scale to new local markets, more rural communities across the province and more widely across Canada. We envision Greater Victoria as a showcase for regional MaaS and as an exporter of convenient, scalable and multimodal solutions.

2.1.2 PROJECT 2 – SMART TRIP PLANNING AND UNIVERSAL PAYMENT PLATFORM (STP)

While Project 1 is the platform to link people, communities, education and employment opportunities together through a broader range of mobility options, Project 2 is the tool to make those mobility services convenient—a critical element to improving multimodal adoption rates. Our trip planner is the critical technology interface between the end user and the MaaS platform. Project 2 will enable a user to plan, book and pay for travel through a single MaaS account. These core functions will be developed and available to all participating MaaS providers in order to establish a single, shared technology platform.

2.1.3 PROJECT 3 – SMART SOUTH ISLAND INSPIRATION CENTRE (SSIIC)

We envision that the SSIIC will serve as the region's shared digital platform for hosting transportation data from various sources and operators into a single, usable platform. This project will establish a trusted data commons to support the functionalities that will help us deliver Projects 1 and 2. This digital platform is critical for enabling third parties to scale the delivery of MaaS and trip-planning and payment applications, which will make the 'integration of services' achievable. It will also enable third parties to access or upload data from various providers by entering into data sharing agreements directly with SIPP, rather than undertaking agreements among many different parties or agencies.

The SSIIC will make transport data more open and accessible to all citizens of Greater Victoria, so that they can make better, more informed decisions related to mobility and the region. This is made possible through the development of open data mapping, visualization, analytics and simulation tools. Over time, we envision that this platform will evolve into a physical, interactive mobility lab dedicated to collaboration, education, and innovation through advanced analytics and data simulation. Entrepreneurs, researchers and others will use the SSIIC to pilot and develop their own projects, businesses and innovative pilots. The SSIIC could also be expanded to address the four other goal areas in our Vision 2040 plan in addition to improving transportation.



Trip-planning smartphone application © Arup

Figure 2.1 outlines the technology architecture and the Smart Mobility Program (SMP) framework for this project. Standardization of data and tools make it easier for new mobility providers to participate in the SMP, and enables new services to be integrated safely and efficiently. This process will also enhance the value delivered from existing mobility services, by enhancing their potential market reach and connecting them with related services. It will enable new partners to join the SMP to address remaining inefficiencies within the region's mobility network by having a clear set of shared standards and common interfaces to services. For example, new transport providers will be attracted to the region for two reasons: rider demand is aggregated across the mobility network, making it easier for new service opportunities to be identified, and a common library of standards and tools reduces time for new services to be validated.

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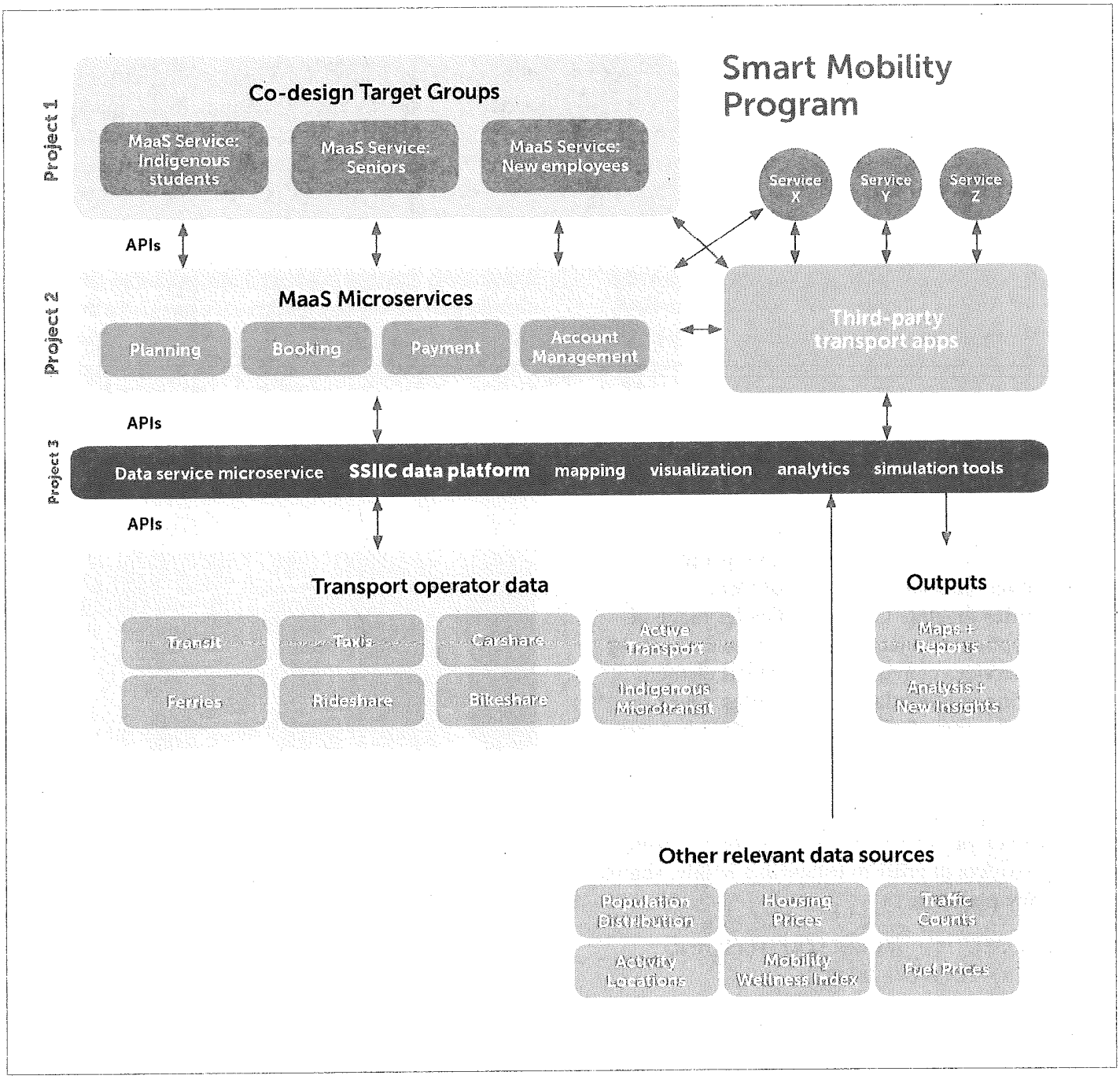


Figure 2.1: Technology architecture and Smart Mobility Program

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Technology details and applications

The MaaS platform is constructed as a framework of microservices that communicate through application programming interfaces (APIs). Developers can configure functionality to be used as part of each deployed MaaS service (see Figure 2.2). New requirements and mobility tools can be added as extensions to the core framework. Mobility tools can be identified as standalone fixed components of functionality accessible by other services.

The advantage of the microservice approach is that changes to external systems have little impact on the underlying deployed services. For example, if the planning microservice uses Google Maps as the primary supplier of directions information, and there is a decision to replace Google Maps or enhance it with another system, the impact to the underlying deployed MaaS services is minimal. This helps ensure future-proofing, so that our platform is not anchored to a single supplier.

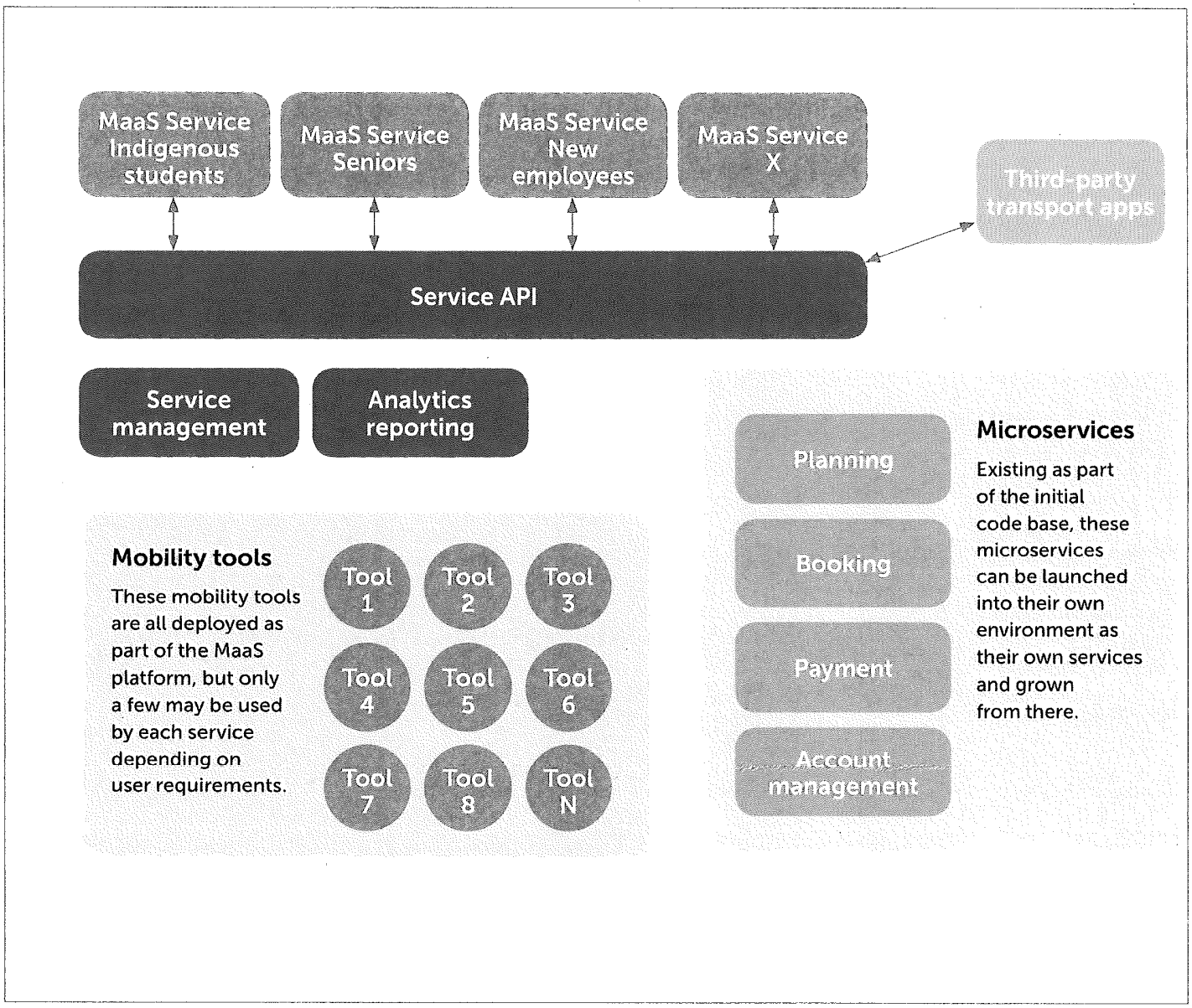


Figure 2.2: Microservice approach

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Project 1: MaaS

As outlined in our Vision (Chapter 1) we focused our MaaS pilots on three co-design groups and introduced an Agile project methodology (Chapter 6) to deliver quick wins, while enabling us to innovate as we iterate and develop the MaaS pilot.

The technology focus for Project 1 will be on the co-design process that will help determine user requirements for the MaaS service. The co-design process provides both the user requirements and customer trips from which we will build the service and adapt the MaaS platform in Project 2. These two projects will then determine the data to be delivered to Project 3, so there is a strong symbiosis between our projects, as well as shared technology and data-sharing benefits across our SMP.

Low-Tech + Low Cost = Maximum Impact

"Sometimes the smartest ideas aren't the most technological ones. If our communities can't benefit from new technologies because some people don't even have connections to WiFi in their home, then we're forgetting that our goal is people."
- Chief Ron Sam, Songhees Nation

Our community can only realize shared benefits from new technologies and mobility services if our solutions have wide-reaching positive impacts for all of our residents. Our engagement with the Beecher Bay (Sc'ianew) First Nation, provided valuable insight to the technology challenges that are faced by residents, who do not have a cell phone tower in the area, meaning data coverage is extremely limited in this location.

Careful consideration has been given to the user interface for the Indigenous Smart Mobility Pilot because data coverage in rural and First Nations communities are often limited. Through engagement with the First Nations communities, it was noted that a text-based notification approach, coupled with a web-based application would be developed in order to reach a wider audience of users.

This strategic choice enables us to not only be a smart city but to also be an inclusive city by providing smart solutions that do not require out-of-pocket costs by the users and are easily scalable to technological and financially vulnerable populations. Taking a low-tech, low-cost approach, while co-designing directly with users to address critical needs, as in this case, can often can yield maximum benefits and realize the smartest solutions.

Table 2.1: Project 1: MaaS technologies

MaaS Technologies	What does it do?	What does it achieve?
User account microservice	Allows registration and authentication of user and account set-up	Interoperability, scalability
API gateway	Provides communications to services within Project 1 and future third party in other areas	Interoperability, scalability, future-proofing, replicability, feasibility
Web app	Responsive website that can be used like an App for user to access or request the MaaS service	Interoperability, inclusivity, scalability
Mobile app	Application written for iOS/Android smartphones to access or request the MaaS service	Interoperability, scalability, future-proofing
Support functions	Functionalities to support printing of itineraries, responsive interfaces, personal phone support or webchat	Interoperability, inclusivity
Mobility tools	Specific tools developed to meet a users' requirements. Examples include a transportation cost calculator, taxi fare splitter, or a supplier dispatch tool to coordinate community vehicle supply with demand (for Indigenous MaaS Pilot).	Inclusivity, scalability, future-proofing

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This initial technology approach ensures that we are delivering on the following outcome statements:

- Convenience – low barrier for users to access the technology required to be a part of the Indigenous Smart Mobility Pilot;
- Affordability – low or no cost to upgrade required hardware/software technology;
- Wellbeing – improving on wellbeing with access to alternative transportation options;
- Inclusivity – this approach ensures the Indigenous Smart Mobility Pilot is available to everyone within the target group, by offering a low barrier and no/low cost to access and use the service.
- Green – users will have improved awareness of walking and cycling options for their trip

In future iterations and Stage Gates, technologies will be developed and scaled to address the needs of the other co-design target groups and markets.

Table 2.2 outlines the MaaS technologies we will be utilizing, what they enable or support, and the goals and outcomes they help achieve.

Project 2: STP

The trip planner is the primary interface between the end user and the MaaS platform. The following are the key functions we will specify for the service delivery partner during the implementation phase:

- Planning: Plan trips using multiple modes of transportation
- Booking: Booking integration of mobility services that include both "on-demand" services (community buses/vehicles, handyDART, and taxis) and scheduled services (BC Transit bus services, BC Ferries)
- Payment: Payment technology that provides a seamless experience for users and enables payment distribution across mode providers. Multimodal payment technologies also provide opportunities to drive new business, partnerships and equity initiatives

Table 2.2: Project 2: Smart Trip Planner

MP2 TECHNOLOGIES	WHAT DOES IT DO?	WHAT DOES IT ACHIEVE?
Trip Planner Microservice	Connects and consolidates travel data sources with trip plan requests	Interoperability, scalability
API Gateway	Provides communications to services within MaaS and future third party in other areas	Interoperability, scalability, future-proofing
Fallback function	Microservice functionality to provide geographic coverage via third party data	Interoperability, inclusivity, scalability

Table 2.3: Project 2: Payment technology

TRIP PLANNER PAYMENT TECHNOLOGIES	WHAT DOES IT DO?	WHAT DOES IT ACHIEVE?
Payment Microservice	Provides MaaS service user functions (registration and management of funds in/out, checks, refunds and termination) required to link to third party banking service. Required for pre-paid and payment gateway payment	Interoperability, inclusivity, scalability, future-proofing, feasibility
MaaS Stored Account API	Communications service to support a pre-paid banking service	Interoperability, scalability, future-proofing, replicability
Multiple Payments API	Communications service to support a pre-paid banking service	Interoperability, scalability, future-proofing, replicability

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- **Standardized Account Management**: Establish shared account management policy and processes across mode providers and network operators to ensure efficient and equitable service delivery to all populations in MaaS service zones.

As a microservice nested within the MaaS technology platform, the trip planner connects to other third party systems to respond to a user trip request coming from a central gateway controller. This is a single point for all trip-planning requests and is made available by an API for all the MaaS services and third parties.

The trip payment platform will support multiple payment types to ensure inclusivity. Use of tokens and digital wallets will be used for both real-time and recurring payments as we move closer toward a cashless society. Payment friction can be minimized improving the user experience while also reducing payment bottlenecks. The platform would also link transport operators to various financial networks to ensure proper payment authorization, settlement and reporting.

Project 3: SSIIC

SSIIC will initially be a digital platform and clearinghouse, integrating a wide range of data from multiple third-party sources including transport operators, municipal governments, and other data providers (detailed in Section 5.2). It will be hosted on a secure cloud-based platform that contains microservices and tools to request, visualize, and analyze mobility data. Data are owned and stored by third parties and would be accessible to the SSIIC by APIs. This hosted service will reside in Canada.

The integration of data within the SSIIC addresses two primary use cases:

- For a MaaS transport app developer, the SSIIC will integrate data to enable the development of universal trip planning and trip payment (e.g. Projects 1 and 2).

- For residents, planners, and decision-makers in Greater Victoria, the SSIIC will integrate data to visualize, analyze, and simulate how mobility is affecting key outcomes.

Over time, the SSIIC intends to evolve into a physical common space, enabling citizens to engage and collaborate on transport and mobility challenges in Greater Victoria. This might include the following:

- Public engagement sessions on transport, urban issues, smart city solutions

- Hackathons on transport and urban issues

- User training and support related to MaaS, data and privacy education

Table 2.4 outlines the technologies and functions related to Project 3. These technologies will be selected from best-in-class providers, developed through SIPP partnerships, or developed through open procurement processes. Open-sourced solutions will always be given priority in keeping with the vision and philosophy of our SSIIC and our governance model.

Table 2.4: Project 3: SSIIC technologies

SSIIC Technologies	What does it do?	What does it achieve?
Data Source Microservices	Connects data requests from MaaS, trip planner, and visualization/analysis (SSIIC) microservices to third-party data provider APIs.	Interoperability, scalability, future-proofing
Mapping and Visualization Tools	Displays transportation network and spatial data as layers on an interactive map, with corresponding charts and graphs	Interoperability, scalability, future-proofing
Analytics Tools	Calculates data from multiple sources to enable analysis of mobility and outcomes	Interoperability, scalability, future-proofing
Simulation Tools	Enables user input of transportation network and spatial data attributes to test the change in outcomes and test "what if" scenarios	Interoperability, scalability, future-proofing
API Gateway	Provides communications for MaaS and third-party developers to connect to the Data Source Microservices	Interoperability, scalability, future-proofing
Open Data Portal Web Application	Provides public access to open data sources and mapping, visualization, analytics, and simulation tools	Interoperability, inclusivity, scalability, future-proofing

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2.2 FUTURE-PROOFING AND SCALABILITY

Future-proofing and scalability are essential to our Smart Mobility Program. These attributes have been integrated into our project's architecture and technical design, the development processes to design the services, supporting partnerships, and open technology standards. Specific elements are detailed in the following sections.

2.2.1 TECHNICAL DESIGN

Microservices Approach with open APIs

This approach has been specifically chosen to support re-use. This approach also enables third parties to access and adopt these services.

Hosting

For our web application model we intend to separate the architecture into presentation, application and persistence layers. This architecture has been designed to scale out by adding additional hosts at the persistence, web or application layers and has built-in performance, failover and availability features. Using a cloud-based hosting model makes it easy to set up, operate, and scale.

Fallback Functionality

This functionality allows usage of basic features in the trip planner to be utilized outside Greater Victoria. This enables potential adopters (municipalities, customers) to have some initial interactions in a live environment.

2.2.2 TECHNICAL PROCESS

Co-design process

The co-design process that guides our projects ensures that the MaaS services, the microservices and mobility tools are intimate to user needs. After co-design, the draft functionalities will be prioritized (by users) by their impact on behaviour and attractiveness to users/new users. This supports widespread adoption by users.

Local innovation challenges

SIPP has a proud record of hosting successful "hackathon"-style innovation challenges (Chapter 4). These have produced highly innovative products and services. This open call for solutions, married with the open platform upon which solutions can be built, provides an incubator and infrastructure that support innovation. These events will continue to have an impact by way of innovators participation, and project visibility and scalability.

2.2.3 TECHNICAL PARTNERSHIP

SSIIC digital platform

The SSIIC will host a centralized library of products (microservices, API Gateways, Mobility Tools and APIs) and business rules (technical, organizational and commercial arrangements to deliver the services). These will be made available to municipalities and other stakeholders in order to increase adoption and reduce development costs.

Scaling across Canada

We have partnered with BC Transit and CUTA to assist with the dissemination and scalability across British Columbia and Canada, notably in creating a Co-Design Toolkit and MaaS guidelines, as well as aligning specific dissemination activities with their wider ongoing networking and technical development outreach.

2.2.4 OPEN STANDARDS

We are committed to a non-proprietary, multi-vendor architecture and procurement. Wherever possible, we will defer to open systems to support transferability of solutions, reduce single points of failure in the design, and enhance innovation wherever possible in the architecture. Open standards allow for rapid and sometimes disruptive innovation to occur throughout the value stack, and truly enable citizen inspired and engaged innovation.



Open Innovation Challenge winner, Simon Park, with his prototype of Caboost, an electric bike assist that can be attached to regular bicycles

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2.3 COMPLIANCE AND STANDARDS

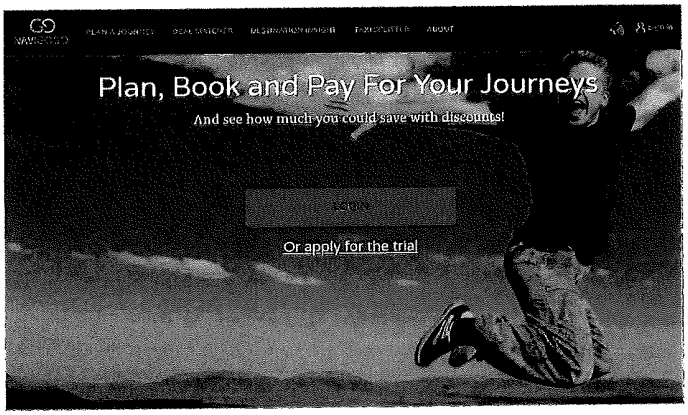
Table 2.5 shows relevant compliance areas and conformity to standards.

Table 2.5: Compliance and standards

Compliance Area	Standards Conformity
Personal privacy/digital rights	PIPA (BC)
Legislation/directives governing financial prudence and exclusions	Fintrac (Financial Transactions and Reports Analysis Centre of Canada) regulations regarding KYC, AML, MSB
Interoperability of ticketing within and between modes	EMV contactless payment standard P2P Tokenization for Card on File transactions
Security in financial transactions featuring credit cards	Payment Card Industry Data Security Standard (PCI DSS) SOC1/SOC2 NIST/ISO security frameworks

2.4 TECHNOLOGY PARTNERS

SIPP will work with its well-developed network of technology partners to deliver the technical solution and integrate component parts. Our diverse partnerships offer SIPP the help and capabilities needed to successfully build out MaaS. These capabilities include: scheduled display, real time display, trip planning, pricing, payment, ticketing, and integrated multimodal route optimization. SIPP has engaged a wide range of technology partners and has received numerous statements of support and interest as evidence of their commitments to supporting our SMP. These statements of support and interest can be reviewed in Appendix 3.



NaviGoGo is a MaaS application designed by young people. © NaviGoGo

2.5 INCLUSIVITY AND ACCESSIBILITY

It is imperative that the advances made through our projects are inclusive, accessible and have benefits for all people. Where digital technologies are a focus, individuals can be excluded because of: (a) poor awareness/promotion of new solutions; (b) lack of access to smartphones, computers or internet; (c) poor data connectivity; (d) poor interfaces or usability. We will promote inclusivity through:

- Considerations of service deployment – e.g. use of free SMS text messaging or helplines alongside digital options (e.g. website or app);
- Ensuring the ability to use digital services offline (e.g. allow users the ability to use WiFi to plan trip but save trip plan for offline use);
- Collaboration and co-design with users to design and test appropriate interfaces and easy usability;
- Using a range of interface and communications options to be fully responsive to users with a range of disabilities;
- Creation of video content, case studies and real-life examples on what to expect when using accessibility features available for modes of transport;
- Trip planner can be designed to provide user profile selections that offer meaningful accessibility information to users, integration of in-transit accessibility information such as walking distances or walk scores, curb ramp availability or sidewalk conditions;
- Call-in services are maintained (see User Journeys page 13).

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2.6 RISK MITIGATION

Table 2.6: Risk mitigation strategies

RISK	MITIGATION STRATEGIES
Technological components are not suited to task	All major system elements will be evaluated for (at least): scalability, interoperability, standards compliance, secure design and extensibility. Our open architecture and capacity to plug and play means we are not tied to any one supplier solution and can adapt and transition services as technology evolves. In our procurement strategy we will include an assessment of vendors' capability to deliver.
Change management practices incomplete	Through our PMO, we will ensure all changes are validated. Changes will be signed off and escalated if they impact form, fit or function.
Architecture is not fit for purpose	Formal architecture design is an integral part of the overall co-design method. Architectural designs will be signed off by steering committee and technology taskforce prior to development.
Lack of inclusivity (digital divide)	Our co-design process will include consideration of potential inclusivity issues related to co-design target groups. As noted earlier, a key issue relating to payment are those people who are unbanked or with reduced banking trust, and solutions such as pre-paid accounts will be explored.

CHAPTER 2 LINKAGES TO OUTCOME THEMES

Convenience
Greater Victoria serves as a showcase for MaaS and scales convenient solutions

Low cost and technology barriers pertaining to the Indigenous Smart Mobility pilot

Affordability
Low or no cost to upgrade hardware/ software technology required

Wellbeing
Improving wellbeing with access to alternative transportation options

Green
Greater access to shared and active modes reduces carbon emissions

Inclusivity
Indigenous Smart Mobility Pilot is available to everyone within the target group by offering a low barrier and affordable access to the service

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CHAPTER 3
Governance

"We were impressed by the broad range of organizations that were actively engaged and the level of involvement of all parties. The effort put in by SIPP in ensuring all stakeholders are fully vested in this project, and that the public good is kept front and centre, is second to none."

– David Oliver, Co-founder and CEO, Greenlines Technology, Inc.

3.1 INTRODUCTION

Poor governance hampers the effective delivery of infrastructure and services. This issue is compounded in the context of smart mobility, as across the world we are seeing an influx of private operators into what had previously been "public" mass transit. Metrolinx, the regional transportation authority in the Toronto region, identified this issue in its report on New Mobility,[1] emphasizing the urgency of creating new skill sets, processes and partnerships with more flexible and responsive procurement processes to encourage private-sector innovation.

SIPP is different. Founded in 2016, we promote sustainable economic development in the interests of our membership, which includes 10 municipal governments, seven First Nations, three post-secondary institutions, seven industry associations and nonprofits, as well as 24 large employers.

We are a public-private partnership (P3) guided by the belief that combining the strengths of each partner will deliver the best outcomes and that our collective action and investment is greater than the sum of its parts. While P3s are strongly associated with infrastructure delivery and risk transfer, SIPP's is similarly positioned to draw on the strengths of each partner to deliver better SMP and project outcomes than if any one party were to operate on its own (also placing risk in the ownership of the partner best suited to manage it).

SIPP has a similar structure and mandate to the Columbus Partnership, the organization behind the winning proposal of the 2016 USA Smart City Challenge. Like Columbus, our collaborative model builds and aligns partnerships with key implementation partners that have similar interests and needs, such as mobility service providers, education and research institutes, technology providers, data specialists, municipal governments and First Nations communities, among others. These strategic partnerships are key to delivering a project this complex and to maximizing the likelihood of successful implementation locally and scalability to other regions of Canada.

3.2 GOVERNANCE FRAMEWORK

Our collaborative governance model allows SIPP to fast track implementation across the region. We can deliver quick wins at each stage of development, thus reducing project delivery time and costs. SIPP was structured by its funders to offer many notable advantages:

- Lean, efficient organization offers value for money
- Vigorous partnership network drives development, coordination and project management
- Diverse membership increases stakeholder buy-in and promotes transparency
- Singular operational focus creates clear priorities and effective processes
- Efficient operational structure can scale during project implementation

3.2.1 SIPP GOVERNANCE

SIPP's Board of Directors includes business leaders, First Nations leaders and academics, as well as legal and accounting experts. Our board operates within a well-defined policy governance mandate using rigorous standards derived from the Carver model, defining roles and relationships in four key areas: governance process (governance style and board responsibilities), strategic objectives (planning, monitoring and evaluation functions), executive

1 New Mobility. Metrolinx, 2016. Technical Paper 4 to support the Discussion Paper for the Next Regional Transportation Plan, http://www.metrolinx.com/en/regionalplanning/rtp/technical/04_New_Mobility_Report_EN.pdf.

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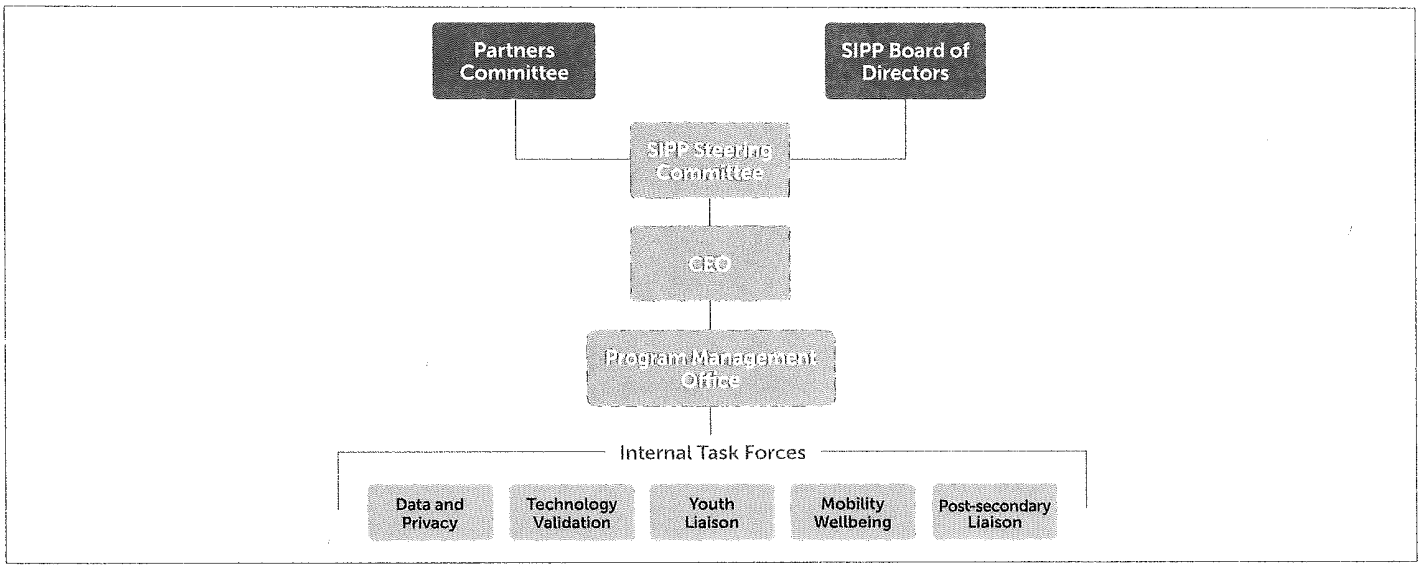


Figure 3.1: SMP governance and organization

limitations (checks on CEO powers including financial planning, asset protection, compensation, staff treatment, and more) and board-management delegation (nature of relationship between Board and CEO including delegation, monitoring and reporting). A finance, accounting and risk management committee supports this critical governance function.

SIPP's Board of Directors is accountable to our membership. The members form a Funder Council that approves bylaws, receives annual audited statements and performance reporting and elects Board members according to a competency-based board recruitment, nomination and election policy. There is a clear delineation between the roles and responsibilities of the Funder Council, the Board of Directors and Operations (led by a CEO) in order to promote effective accountability, transparency and mission focus.

3.2.2 SMART MOBILITY PROGRAM GOVERNANCE

Figure 3.1 details the governance structure for the SMP. Since 2017, SIPP has had a Smart Cities Steering Committee, which meets biweekly and is comprised of Board members and key implementation partners. The Steering Committee is comprised of the Mayor of Victoria (and Chair of the Partners Committee), the CEO of BC Transit, a Councillor from Esquimalt (and representative-at-large of the Partners Committee), the Executive Director of Songhees Nation and SIPP Board members and CEO.

A strategic advisory committee called the Partners Committee, which meets bimonthly, represents 11 local and First Nations governments and community leaders. The Partners Committee provides critical linkages to government and community stakeholders and establishes key program criteria, such as the challenge statement, outcomes statements and Vision 2040. In addition, SIPP has specialized subcommittees and taskforces to ensure the SMP aligns to agreed-upon outcomes and local priorities.

The Steering Committee has primary accountability for managing the day-to-day implementation and integration of the three SMP projects and will be supported by the Program Management Office (PMO), with staff and contractors managed by the CEO, along with associated taskforces.

The PMO will provide oversight across all three projects comprising the SMP and will align the delivery with Steering Committee direction. It will facilitate the sharing of resources, planning and information to manage dependencies between the projects. It will also help coordinate the three SMP projects, while setting standards for how each project should be delivered. The PMO will liaise the program management function with staff leads for data management, community engagement, partnerships and technology.

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Financial Oversight

SIPP has the financial enterprise systems in place for an effective compliance environment, which will apply to the delivery of the SMP as well. Specifically, role-based permissions and approval limits are predefined and tailored based on stakeholders' intimate knowledge. Funds will be managed, tracked and governed using fund accounting in the financial enterprise system, and the PMO will be supported by a certified financial controller and legal counsel.

Sound financial internal controls are in place, including segregation of duties, approval limits, third-party validation, quality assurance practices and internal audits. In addition, other financial practices include retention of a part-time CFO, a certified accounting and bookkeeping firm, and an active Financial, Audit and Risk Management Committee. This allows SIPP to be flexible, manage financial and governance risks and comply with government financial reporting requirements.

On a monthly basis, the financial statements, which comprise the statement of financial position, statement of operations, changes in net assets, and statement of cash flows, will be prepared in accordance with the Canadian accounting standards for NFP organizations. The financial statements are approved by the Financial, Audit and Risk Management Committee on a quarterly basis and subsequently by SIPP's Board of Directors. On an annual basis, the financial statements will be audited by a member-appointed external auditor (historically KPMG).

Taskforces

Our taskforces help SIPP access the knowledge, local, national and international networks, and expertise of diverse stakeholders and subject matter experts. Applying these lenses allow program ideas to scale and find multiple applications for tools and technologies.

- **Data and Privacy** is co-chaired by the Chief Information Officer (CIO) and Chief Technology Officer (CTO) from the City of Victoria and includes the CIOs/CTOs of 10 other municipalities. It is responsible for considering data availability, data accessibility, data sharing, data security and data privacy, as well as making recommendations for inter-municipal cooperation.

- **Technology Validation** provides technology guidance with a focus on user requirements. It provides input on the technical feasibility to design, deploy and maintain the proposed projects, the long-term viability and scalability of proposed solutions and performs technical validation with local and global experts.

- **Youth Liaison** provides an ad-hoc organization to explore youth engagement in the SMP. It will research barriers to multimodal transportation that young people experience and make recommendations on ideal engagement techniques.

- **Mobility Wellness** oversees the regional MWI throughout the project as outcomes are monitored. It will guide refinement of future iterations and provide advice on how to scale the index to other cities in Canada and beyond.

- **Post-Secondary Taskforce** provides coordination with the University of Victoria, Royal Roads University, and Camosun College in the development and implementation of the SMP.

3.2.3 SIPP PARTNERSHIPS

Our proposal is built on firmly established partnerships and collaboration, and we draw on expertise and resources from a broad array of industry experts, political leadership and national and international smart city peers. Many of these partners have collaborated with us already in the development of the SMP. This proposal is a testament to our effort to collaborate with our partners who have contributed their expertise throughout this application. With our aligned priorities and investments, the impact the Smart City grant will have on our community, and across Canada, will be amplified many times over.

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SIPP's partnership model demonstrates exceptional community support and alignment. We have four partner categories: funding, program, funded development and research, and collaborative. Not only do these partners reduce risks associated with lack of buy-in down the road, they also represent key implementation partners. If awarded the grant, this will allow SIPP to immediately mobilize, implement and scale program delivery. Our partnership model also provides the opportunity for collective advocacy in key areas of the economy and mobility.

SIPP has phenomenal community and stakeholder support in Greater Victoria, BC, Canada and the world (see 117 letters of support in Appendix 3). In addition, SIPP has established strategic memoranda of understanding (MOUs) to foster enhanced collaboration with three key partners: Shanghai's Centre for Smart City Promotion (China), Camosun College and currently under development with the city of Columbus, Ohio (USA).

(See full partners list in Appendix 4 and summarized in Figure 3.2.)

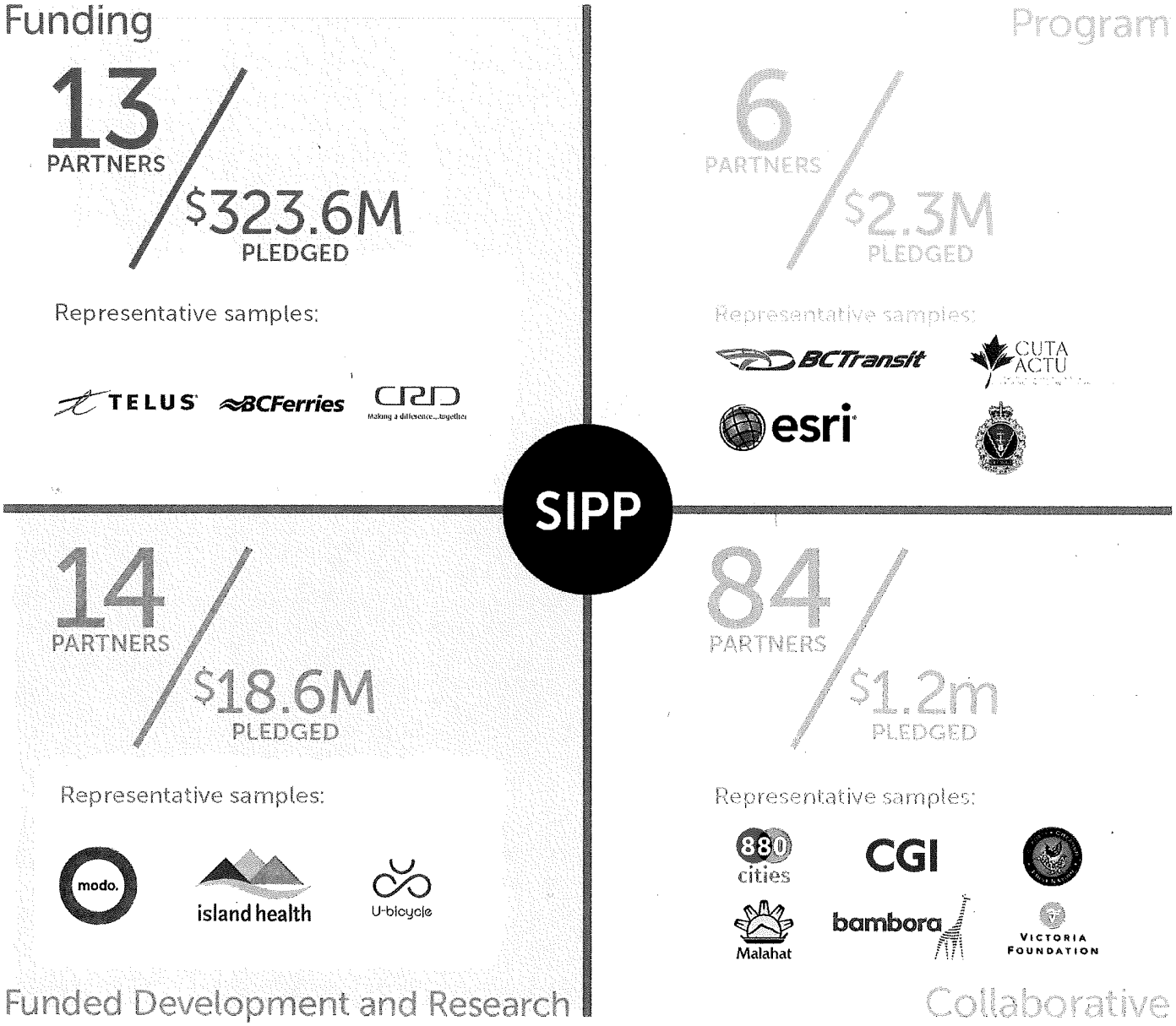


Figure 3.2: Implementation partners matrix

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Representatives of SIPP and Camosun College after signing the Indigenous Smart Mobility Pilot MOU

Key contributors to the projects include:

Funding Partners: Supporting capital, infrastructure (hard and digital) and operational initiatives that leverage and support the $10 million grant

Our **10 municipal partners** have listed aligned funding contributions in the form of capital and operational initiatives such as hard and digital infrastructure investments, planning, assets and alignment and collaboration across smart transportation initiatives. Private-sector investments in digital infrastructure like **Telus** will also help to achieve the project outcomes by providing a landscape for fast connectivity, data sharing and Internet of Things (IoT) solutions.

Program Partners: Direct contributions of in-kind materials, assets or staff time to advance our initiatives

BC Transit sees SMP as well-aligned with its corporate strategy to reimagine how it manages and operates services across the province. It has been engaged from the outset in the design of the projects and expects to provide key planning expertise, data and other in-kind contributions. The CEO of BC Transit sits on the Steering Committee.

The **Canadian Urban Transit Association (CUTA)** has contributed to the development of SMP and will be a key partner in implementation, significantly multiplying the impact and scale of project funding. CUTA's role is to represent the voice of the industry, to champion open systems, align their own ongoing research and development and, most importantly, ensure scalability across Canada.

The private sector is also coming to the table, including in-kind contributions from **Esri**, **Arup** and **ESP Group** to bring forward and accelerate the program implementation. If awarded the grant, this category will significantly increase with the addition of technology partners. Until now, we have remained strictly independent to ensure we adhere to open technology and data standards and to maintain community control over SMP governance and SMP design (Chapter 6).

Funded Development and Research Partners: Commitment to aligned research and/or funded development that can be applied to advance the SMP

University of Victoria, Royal Roads University and **Camosun College** are key partners, as they have committed to aligned research and development activities in research fields, such as Indigenous transportation networks, mobility wellness, climate change, autonomous vehicles and future transportation modes (Appendix 4).

Privacy Dynamics Inc. will provide data privacy experts, in conjunction with **Harvard University**, to develop a Private Data Sharing Interface prototype, which will allow scientific researchers to perform exploratory data analysis of sensitive human subject data. Privacy Dynamics will provide the hosting and operational support guidance on technology selection and development. The Harvard team brings together research expertise in differential privacy, geospatial data science and standards development.

Collaborative Partners: Aligned outcomes, policy and activities objectives

A substantive number of collaborative partners have also pledged their support for the SMP and have policy and programs that would benefit by its successful delivery. This list of over 80 partners includes but is not limited to governments, civil society and community groups, mobility providers, thought leaders and digital service providers, as well as international and national smart cities peers (Appendix 4).

We wish to gratefully acknowledge our collaborators and supporters for their collective contributions and their enthusiastic support of its goals.

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3.3 LOOKING TO THE FUTURE

The diversity of our partnership team makes us resilient, as we will never be reliant on any single partner. It has also been built with the future in mind as an ongoing legacy for the region. The governance and structures we have put in place will carry on beyond the life of the project. The PMO will serve as the foundation for the SSIIC, bringing in people and capacity to support smart mobility over the long term. We see our P3 as a model for other cities and regions, and our learnings will form part of our collaboration with our region and plans for dissemination and scalability.

3.4 RISK MITIGATION

Table 3.1: Risk mitigation strategies

RISK	MITIGATION STRATEGIES
Loss of community control over program outcomes and objectives Loss of community influence over planning, system design and delivery	Community engagement and aligned partnerships are central to our mandate, our P3 governance structure and our commitment to collaboration, openness and ethical practices. Based on insights from Columbus Partnership and others, we created a vendor engagement strategy to ensure we have the most flexible procurement and partnership models that do not tie us to any specific proprietary services or cookie-cutter smart city products, concurrent with the open co-design process we undertake with communities.
Continued buy-in and alignment with partners Loss of partner commitment to funding contribution Partner capacity to deliver Partner readiness and alignment to project timescales	We have a strong track record of engagement and alignment with partners established over several years and will carry that success and learnings forward into our implementation. Our governance model is being strengthened over time as more and more stakeholders perceive the value and trust in SIPP's commitment to public good. This growth has led to partnership diversity, one of our key strengths, which means we are not reliant on a single or small group of partners. Where the capacity of one partner may be weak, the excess capacity of other partners will address the gap, allowing implementation to proceed with minimal risk. From our years of working with our partners, we have a strong understanding of their engagement level, capacity and readiness and have framed our projects, project delivery structure and timelines to align with these learnings.
Changes to the political environment	With the recent municipal elections, we have fully engaged with the new councils, and have continued building our relationships with Chiefs and Councillors from local First Nations partners. Our proposal has gone before the Partners Committee and the project will be largely complete and transitioning to ongoing operations before the next election in 2022.
Emerging BC ride-hailing legislation (*Passenger Transportation Amendment Act*)	The province is currently consulting on ride hailing and expects to introduce new legislation this year. We have advised on this consultation and will monitor the legislation as it advances. A key benefit of our approach is that it does not rely on any one form of transportation; rather, it flexibly incorporates existing transit operators and emerging or changing modes as they arise in the marketplace. This mitigates any unforeseen variables within provincial legislation.

CHAPTER 3 LINKAGES TO OUTCOME THEMES



Convenience

Collaborative transportation partners agree to share data, improving the convenience and ease of access to different transportation modes for the end user



Affordability

Operational structure can scale during implementation

Partnerships provide aligned funding for lower user costs



Wellbeing

Mobility Wellness Taskforce oversees the MWI through the projects to monitor outcomes and provide advice on scalability



Inclusivity

Diverse membership increases stakeholder participation and promotes transparency

Vigorous partnership network drives development, coordination and project management

Youth Liaison Taskforce provides an opportunity for youth engagement

Close collaboration with civil societies, NFPs

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CHAPTER 4
Engagement

"The open innovation challenges allowed us to think about how we source new ideas and innovation for our business operations differently. After the Future Innovator Challenge, we were so impressed by a team of students that we invited them to discuss their concept for an app called Bus Bank with the BC Transit team."

– Erinn Pinkerton, CEO BC Transit & SCC Steering Committee

4.1 INTRODUCTION

SIPP's most significant strength, as an organization and a regional voice, is in accessing the exponential power of partnerships and collaboration. Over the past two years, SIPP has become a central facilitator of Smart Mobility transformation and a leading cohesive voice in our region. This chapter outlines the progress of SIPP's engagement activities, as well as how lessons learned and relationships built through those activities have framed our proposal and will guide our continued engagement during implementation.

Our capacity and depth as an organization enables us to meaningfully engage citizens and stakeholders, address a wide spectrum of regional issues, provide thoughtful leadership and facilitate knowledge sharing to proactively address the most pressing issues for Greater Victoria. We boast a unique strength in the "people power" behind our engagement capacity—our diverse and dedicated staff, leaders, taskforces, stakeholders and peer cities (Chapters 3 and 6) will guide and support our engagement activities during implementation.

4.2 SIPP ENGAGEMENT APPROACH

Over the past two years, SIPP has brought its adage "Citizen-Inspired Transformation" to life, by demonstrating our passion and commitment to co-creation, inclusive governance and citizen-focused engagement.

To date, we have used an engagement framework developed by the International Association of Public Participation (IAP2), which is comprised of five progressive engagement levels outlined below. We have put this approach into practice through all of SIPP's engagement activities, ranging from broad public forums and general awareness building, to in-depth surveys and one-on-one dialogues.

Engagement level

Inform	To provide balanced and objective information in a timely manner
Consult	To obtain feedback on analysis, issues, alternatives and decisions
Involve	To work with the public to make sure that concerns and aspirations are considered and understood
Collaborate	To partner with the public in each aspect of the decision making
Empower	To place final decision-making in the hands of the public

International Association of Public Participation engagement levels

We have applied this approach with stakeholders at many levels, consulting with mayors, First Nations leaders and CEOs to often-overlooked groups such as students, who we empowered through a Youth Liaison Taskforce. We consult and collaborate to be as inclusive as possible, hosting roundtables with the Disability Resource Centre and at Camosun College with Indigenous students. We inform new residents about our projects at the Intercultural Association, a local immigrant and refugee centre. Our shared vision and our solutions are stronger when we engage together.



Camosun students at pop-up poll

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4.3 ENGAGEMENT TO DATE

Figure 4.1 details SIPP's engagement to date, highlighting the IAP2 levels of engagement associated with these activities. This is followed, on the next page, by detailed descriptions of our activities and the insights that illustrate our capacity and committed track record to "Citizen-Inspired Transformation" and focused engagement that will drive our implementation plan.

Engagement statistics at a glance

#freedomtomove Campaign:

- Social media impressions – **355,600**
- TV / Radio impressions – **948,100**
- Website hits – **12,600**

Other engagement:

- Public attendance at events – **1,450**
- One-on-one engagements at Pop-up Stations – **300+**
- In-depth survey completions – **562**
- Number of posters throughout the city – **1,750**
- Smart Mobility Manifesto signatures to date – **914**
- Proposals received for Innovation Challenges – **140+**

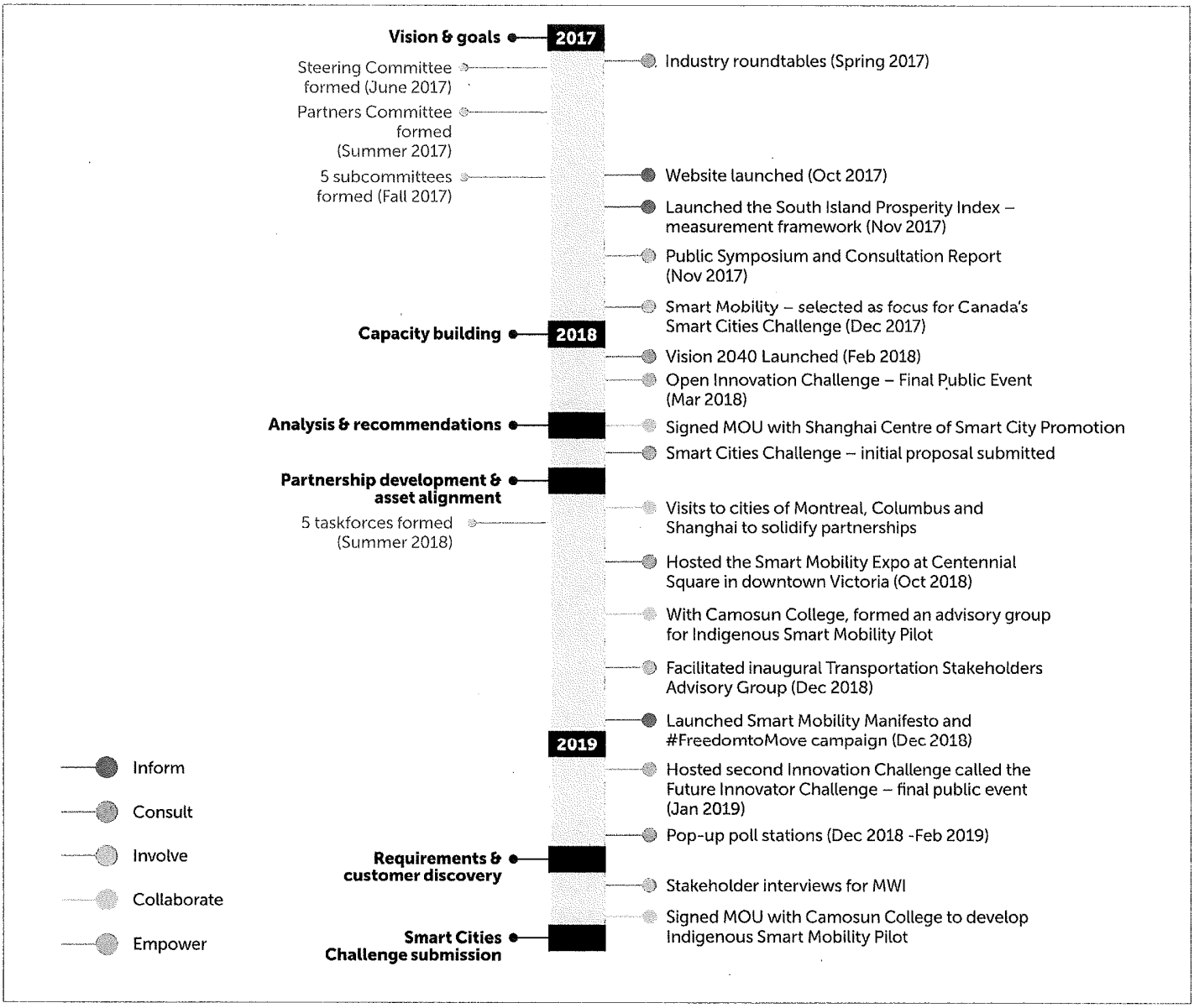


Figure 4.1: SIPP engagement timeline

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4.3.1 DETAILED ENGAGEMENT DESCRIPTIONS

Kick-off stakeholder roundtables: Industry and stakeholder engagement around developing a regional strategy to promote Greater Victoria as a centre of excellence for "clean, connected and competitive cities" with the University of Victoria (UVic), yielding ideas, dialogues and engagement that informed our SCC initial submission.

Steering Committee: Coordinates broad outreach efforts, ensuring that all stakeholders are represented.

Partners Committee: Advises the Steering Committee, playing an active role in shaping and developing Vision 2040 and our SCC proposal (Chapter 3).

Website and social media platforms: Public engagement website launched in September 2017 (www.smartsouthisland.ca) as a platform for involving the public in SIPP issues and initiatives. This is augmented across multiple social media platforms.

South Island Prosperity Index: Annual reporting index, to be updated in March 2019, provides a snapshot of the region's wellbeing, measures progress on five outcome statements through 140 indicators (in alignment to the World Council on City Data's ISO 37120 framework) and compares these to Canadian peer cities to add context.

Smart South Island Public Symposium: Public event, attended by over 350 people and facilitated by award-winning Canadian urbanist Charles Montgomery to exchange ideas with citizens and share information about the SCC challenge themes. Incorporated innovative tools such as real-time polling on smartphones to gauge opinions.

Sub-committees: Representing 50 organizations and active November 2017 to March 2018, engaging stakeholders and industry leaders to provide expertise, engage target audiences and refine the initial proposal.

Open Innovation Challenge: SIPP engaged residents as co-creators in addressing Smart City innovations related to outcome statements. Produced 69 projects over eight weeks, with 10 finalists selected by a jury. The top three finalists received $15,000 grants, and the three projects are currently in implementation under SIPP guidance.

SIPP Taskforces: SIPP taskforces guided initial SCC proposal, oversees the MWI, hosted pop-up polls and special events, engaged youth (Chapter 3).

Stakeholder and peer city consultations: Strategic knowledge sharing with both stakeholders and international peers—including Victoria Disability Resource Centre; Intercultural Association of Victoria; Canadian National Institute for the Blind; peer cities (noted earlier); BC Office of the Privacy and Information Commissioner; BC Minister of Transportation; BC Minister of Jobs, Trade and Technology and BC Minister of Finance (August 2018–February 2019).

Smart Mobility Expo: Expo of over 25 vendors designed to introduce citizens to the spectrum of smart, multimodal options available now, or in the near future, including an electric ferry, smart buses, e-scooters, carshare, hoverboards and electric bikes.

Transportation Stakeholders Advisory Group: Convened over 30 transportation stakeholders from both public and private sectors to discuss data sharing, collaboration and regulatory policy.

Smart Mobility Manifesto and #FreedomtoMove Campaign: Campaign in support of SIPP's SCC challenge statement and Smart Mobility Manifesto, collecting citizen-submitted videos using the hashtag #FreedomtoMove. Campaign included ads on buses, TV, radio, and in newspapers.

Travel habits survey: To understand current consumption and attitudes among a diverse range of people. Survey yielded over 500 responses over 12 weeks.

Future Innovator Challenge: Second innovation challenge in partnership with post-secondary and secondary schools, yielding nearly 80 student submissions. Six finalists were shortlisted and made a final live pitch to judges and the general public.

Pop-up Polling Stations: Yielded over 50 hours of engagement and 300 face-to-face conversations, with a focus on reaching residents who may not have access to web-based materials. Camosun College and University of Victoria were among hosts.

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4.3.2 KEY FINDINGS

After meeting face-to-face with hundreds of citizens and stakeholders in Greater Victoria, and engaging indirectly with thousands more through surveys, campaigns and online impressions, we learned a lot about our fellow citizens and their needs, aspirations, challenges and hopes for the future. We reaffirmed how valuable citizen-inspired action is to our mission and to achieving our shared vision for a smart mobility future.

Key insights and lessons learned during our two-year engagement process now form the foundation for our SCC approach. These include the following:

Co-design produces meaningful direction

A broad spectrum of SIPP members and citizens actively guiding and participating in decision-making creates proof points and strong buy-in at each engagement stage. SIPP's Partners Committee plays a critical role as a connection point between each government body and the SIPP Steering Committee, ensuring smooth communication and engagement and meaningful outcomes.

By bringing a broad spectrum of transportation stakeholders together, SIPP achieved consensus on a set of data-sharing principles. From this, SIPP developed a list of 10 Principles for Emerging Multimodal Options, which was shared with the BC government to inform provincial legislation for ridesharing industries slated for fall 2019.

Validation from citizens

We listen, iterate and innovate through our engagement activities. Respondents to our transportation surveys contributed data and feedback that helped inform and validate the SCC proposal by affirming two critical issues:

- Our region is not sustainable along its current path.
- More and better access to transportation is the solution to this challenge.

Following the launch event of our 2017 Prosperity Index, we engaged and empowered the audience to suggest and provide guidance on how SIPP might improve and update its next iteration. Through their involvement, we learned of citizen's strong interest in learning more about the linkages between social, environmental and human health impacts, which inspired and drove our creation of the MWI.

Taking advantage of new tools

We use a wide variety of smart tools in our engagement activities and will continue to learn, share, and develop new engagement tools to reach, collaborate, and connect with citizens. We used smart technology to conduct real-time polling at engagement activities, enabling us to quickly and adeptly understand our audiences, as well as to identify which citizens we were not reaching. For example, youth were underrepresented early on, which led us to create the Youth Liaison Taskforce.

Through their student-focused engagement, SIPP's Youth Liaison Taskforce identified a previously unknown need to educate high school youth about their digital rights, an issue being introduced around the world to inform, educate, and engage youth in understanding their rights and relationship to data. The Taskforce is currently developing a digital literacy information kit to share with local high schools. This is a tool that could be replicated and scaled for use across many jurisdictions to foster "smart citizens" from an early age.



The Youth Liaison Taskforce discussing smart mobility and regional transportation issues with University of Victoria students

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Engagement objectives

1. Ensure the long-term viability of the program
2. Ensure that diversity and inclusion goals are met and that all residents, including those most underrepresented, feel that their voices can shape the projects
3. Enlist residents as co-designers of projects
4. Ensure that partners provide input at key stages of implementation
5. Ensure that governments (at both political and staff levels) are consulted at appropriate stages of implementation
6. Ensure that ongoing engagement is embedded into project design

Readiness for Indigenous Smart Mobility Pilot

Through close consultation with First Nations communities, education facilities—Camosun College, Saanich Adult Education Centre (SAEC) and University of Victoria—we have been able to engage Songhees First Nations, Beecher Bay and SAEC to survey students on their travel patterns and how this aligns with the current transport services. Through this engagement with multiple First Nations communities, we have been able to secure the use of existing community-owned and -operated vehicle assets (community buses, vans, personal-use vehicles) to be used for the Indigenous Smart Mobility Pilot. The level of coordination and collaboration is a testament to the shared vision that these communities have, to improve the mobility options available to their students and residents.

BC Transit has also offered driver training to those communities for the pilot further demonstrating the engagement and collaboration that has been performed to make this a reality.

4.4 ENGAGEMENT PLAN FOR IMPLEMENTATION PHASE

The following engagement plan for our implementation phase ensures that our process builds on the co-design approach and focuses on diversity, inclusion and equity, while remaining accessible to everyone across the region. Our engagement objectives (see above) will be the lens through which we plan, develop and make decisions regarding our engagement and outreach activities. We will encourage our partners and co-designers to do the same as we advance our decisions and designs and move into implementation.

4.4.1 TARGET ENGAGEMENT GROUPS

Building on our activities to date, engagement of a broad cross section of Greater Victoria residents will be critical to driving program implementation. However, we will prioritize our three co-design target groups (Indigenous students, seniors and new employees) throughout our implementation engagement plan.

This section highlights the primary groups we intend to engage during the implementation phase. A comprehensive list of implementation partners, who are critical to achieving our outcomes, can be found in Chapter 3 and Appendix 3.

4.4.2 STAKEHOLDERS AND PROJECT PARTNERS

To ensure effective design, development and implementation of all project components, SIPP will engage stakeholders and partners that span a variety of disciplines. They are outlined in general categories below as they relate to our engagement plan. A comprehensive list of our implementation partners, who are critical to our engagement initiatives, can be found in Chapter 3 and Appendix 3.

4.4.3 GOVERNMENT PARTNERS

SIPP's government partners are crucial to our organization, as well as to our engagement and implementation plans. To ensure that project design and implementation are coordinated with both existing and future infrastructure or investments, local municipal and First Nations communities will

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be consulted through various engagement activities across all project stages. Beyond SIPP's existing government partners, we will focus our engagement on government ministries, agencies and institutions that have a role within the mobility and transportation industries. We aim to use smart city funding at critical moments, to align with provincial government funding opportunities and to identify when and how we can best align our projects alongside BC Government initiatives and opportunities.

4.5 ENGAGEMENT METHODOLOGIES

This section highlights how, when and at what levels we intend to engage with our citizens and stakeholders during the implementation phase.

4.5.1 KEY ENGAGEMENT DESIGN PRINCIPLES:

- **Lead with diversity:** SIPP's citizen-inspired approach and diverse governance model is designed to maximize inclusiveness of residents and stakeholders, ensuring our design process and projects benefit a wide variety of people including those who are often underrepresented. SIPP has received international recognition for its governance model.

- **Engage across the whole spectrum:** We go beyond traditional levels of consultation and embrace direct participation. SIPP has piloted two open innovation challenge competitions and incorporated this approach into the SSIIC.

- **Co-design:** Because SIPP's experience with co-design, and our plans to continue to use it throughout implementation, we are confident we can deliver better and more inclusive ways to achieve our outcomes (Chapter 6).

- **Measure early and often:** Engagement is a key component of social outcomes. SIPP's MWI is an ongoing engagement and measurement tool. Users will be able to submit feedback about journey satisfaction, access information to inform decision-making and access data that helps gauge willingness to change modes or behaviour. By tracking these metrics—from user engagement to their journeys and mode shifts—we will establish a method of measuring and achieving outcomes.

4.5.2 ENGAGEMENT ACTIVITIES

Our challenge theme "freedom to move" anchors our vision for a shared mobility future in Greater Victoria that is designed by and for citizens and as a result, provides a vibrant, innovative and measurable approach to engagement with our communities.

Key Activity: Ongoing guidance and leadership

Steering Committee: The Steering Committee will be expanded during SCC implementation to ensure a broad and diverse group of stakeholders are contributing to critical decisions at key Stage Gates and on issues of specific interest or expertise.

Partners Committee: Municipal and First Nations leaders will continue to be engaged through this committee. It remains an effective way to liaise with multiple governments at once at critical Stage Gates.

Engagement levels: Inform, consult, involve

Key Activity: Public and stakeholder engagement

Webpage: SIPP will maintain the Smart South Island website through all phases of implementation to build awareness for the SMP so we can establish baselines for addressing behavioural changes that will improve outcomes.

Smart Mobility Manifesto and multimedia campaign: This multimedia campaign will continue to roll out over the coming months as the region prepares for implementation. Awareness will be key to deeper levels of engagement during the implementation phase. Other cities, including Montreal and Columbus, have expressed interest in adopting this Manifesto as a ready-to-implement toolkit.

South Island Prosperity Index: This regionwide annual report card is an annual opportunity for SIPP to report on overall progress of Smart South Island, along with the macro-indicators about the region's progress toward Vision 2040.

Engagement levels:
Inform, involve, collaborate, empower

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Key Activity: Engagement through co-design

Project 1: Integrated MaaS

We will conduct initial engagement activities with the three co-design target groups (and relevant partners including W̱SÁNEĆ School Board and First Nations governments, senior service centres, the Disability Resource Centre and the Intercultural Association) through focus groups, followed by beta-testing groups to provide active co-design inputs to the service and technology developers.

Project 2: STP

Engagement will involve multiple touch points but primarily will focus on the three co-design target groups.

Mobility Wellness Index

The first iteration (March 2019) will present the framework, as well as showcase the dynamic indicators that will be developed in the future. This version will be used to capture feedback from various target audiences through focus group sessions, going beyond the engagement activities described above that were used to design the beta MWI.

On an ongoing basis, MWI will become the primary tool that will allow residents to better understand their mobility experience and influence behavioural change (for example, features that show how their wellness has improved or their carbon footprint has been reduced through their mobility choices). Journey satisfaction and other data will be used to determine baselines and shortcomings of the mobility system and will inform policy and planning decisions.

Engagement levels: Involve, collaborate, empower

Key Activity: Ongoing consultation and citizen-led innovation

Project 3: SSIIC

Through the SSIIC, a diverse range of projects can be nurtured from ideation through to concept, to pilot and eventual scaling all while building public capacity and empowering our citizens.

Engagement levels: Consult, collaborate, empower

4.6 DIVERSITY AND INCLUSION FRAMEWORK

Beginning in 2017, we sought to understand the stories of people in our community who are disadvantaged and underserved by our current transportation system (see co-design target groups in Chapter 1). Building a regional transportation network that serves everyone requires a profound understanding of how certain groups are excluded. As explored throughout this chapter, SIPP is addressing this issue head-on by co-designing the early iterations of the MaaS solution alongside our three co-design target groups, before scaling solutions up to serve broader sets of users that face similar challenges (Chapter 1).

4.6.1 CO-DESIGN TARGET GROUPS: CONTEXT AND SCALE

Indigenous students: There are 10 First Nations communities and 17,245 Indigenous people on South Vancouver Island. Only two of the 10 reserves are close enough to the urban centre to access education and career opportunities off-reserve. The other eight are rural, remote and not served by public transit; their residents have less access to education and career opportunities, and spend a higher percentage of household income on transportation.

Scale: Engage to test and scale to other rural and remote populations regionally and nationally.

Seniors: As a popular retirement destination, Greater Victoria is home to an aging population that is far greater than other cities (21.1% of our citizens are over age 65, compared to the national average of 16.1%).

Scale: Engage to test and scale to other unique mobility users, who—if offered reliable, customized and convenient mobility options—would make more recreational and social trips (such as citizens with mobility challenges or accessibility needs).

New Employees: New employees encompass a significant percentage of people moving into Greater Victoria. These include, but are not limited to, Canadians moving in from other areas, immigrants, new students, and others who are

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just arriving in Greater Victoria. We must engage and embrace new residents in our communities and workforces to maintain our region's strong economic competitiveness.

Scale: By meeting the unique mobility, information and engagement needs of new residents, we can scale to other populations, like our region's large international student population for example, as they would benefit similarly.

4.7 RISK MITIGATION

Table 4.1: Risk mitigation strategies

RISK	MITIGATION STRATEGIES
Lack of trust between target stakeholders/ partners/ governments	SIPP's inclusive governance model has representation from a diversity of groups as members who will be engaged fully throughout implementation. We will continue the efforts that have been made throughout the process to build long-term relationships and trust by consistently engaging, building in time for continuous communication, reporting back on results and allowing time for validation of results.
Difficulty engaging the general public on highly technical content	We will invest time in translating complex technical content into accessible engagement materials. By developing clear key messages and breaking down complex ideas, we will ensure the public remains engaged and interested. We will also enlist our co-design target groups to create public-facing content that is more palatable to their user groups and to general audiences.
Our co-design target groups face barriers to participation	We will work with project partners to understand the barriers these groups may face in engaging with our work. We will reduce these barriers where possible (i.e. travel subsidies, accessible venues, accessible materials, online and in-person, etc.). In other words, we will 'meet them where they are at' in both physical space and capacity to engage.
Perception that decisions are being made behind closed doors	The results of our engagement activities will be communicated back to participants (and made public) in summary reports that highlight what was heard and how it influenced decision-making. SIPP's governance structure is built on collaboration and having many voices around the table. We will clearly communicate who is making decisions and how they are being made. The SSIIC will also encourage transparency and discovery.
Overlapping and potentially conflicting interests of numerous partners or tensions between user groups/perception of inequality	SIPP's governance model is independent and often coordinates the shared interests of its members. SIPP is viewed as an "arms-length" organization, meaning its structure as a public-private partnership enables it to act on behalf of the public good and is not beholden to any particular group(s).
Certain voices dominate the process	We will maintain contact lists, track participation and categorize information shared (disaggregating for co-design target groups and gender) to help us understand who is participating, whose perspectives we are missing, and how the issues and needs of different stakeholder types differ. We will engage our co-design target groups in each stage of implementation to ensure diverse and inclusive voices are not just included but are meaningfully incorporated throughout.
Expectations that mobility projects will immediately solve the region's transportation issues	We will manage expectations by communicating and reporting regularly on expected outcomes and timelines in a transparent and realistic way through our engagement materials and through SSIIC and by measuring our progress with our identified performance measurement tools and standards (Chapter 7).

CHAPTER 4 LINKAGES TO OUTCOME THEMES



Affordability

Engaged Songhees and Sc'ianew Nations and SAEC to coordinate existing vehicle assets for the Indigenous Smart Mobility Pilot to keep costs down



Wellbeing

The Youth Liaison Taskforce is developing a digital literacy kit for local high schools that could be replicated in other cities

MWI ongoing engagement and measurement to gauge wellbeing through both quantitative but also, highly engaging 'gamification' methods to collect qualitative data and influence behavioural change



Inclusivity

The collaborative inclusive membership model

SIPP's many engagement activities have involved diverse people and perspectives and have informed us on gaps and future engagement plans

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CHAPTER 5
Data and Privacy

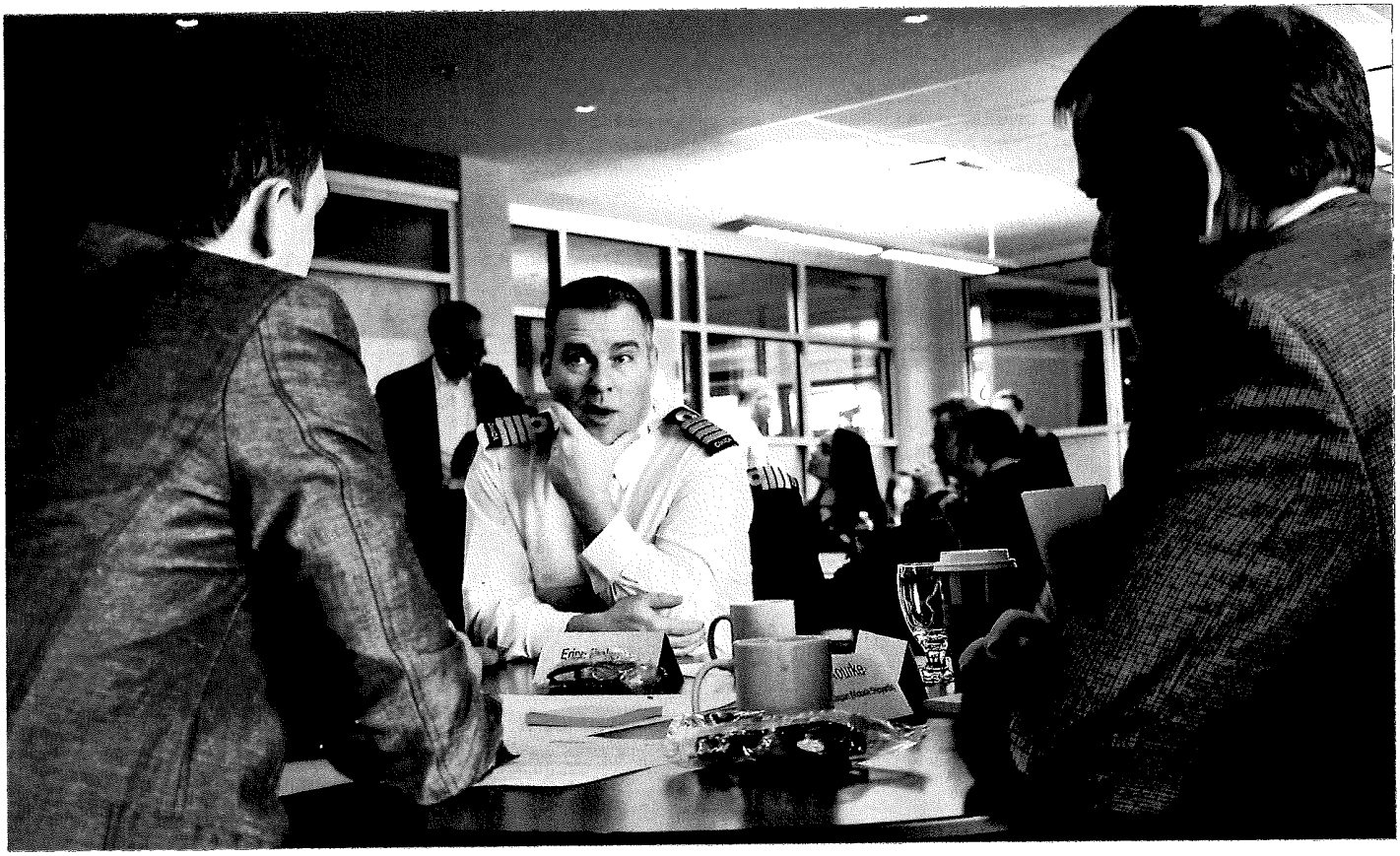
"Data has the power to transform our communities, but only when it is valued less as a commodity and more for its potential to improve citizens' lives. This is the driving ethos of our Smart South Island Inspiration Centre."

– Mike Palmer, Co-Chair SCC, Data and Privacy Taskforce, Chief Information Officer, City of Victoria

5.1 DATA AND OUR PROJECTS

Data are fundamental to the success of the three projects in the SMP. The integration of transport data throughout our projects will enable Greater Victoria residents to make more convenient, affordable and green mobility choices. Data from these transport operators, combined with other civic data sources in the SSIIC, will provide input into the MWI, which allows us to monitor progress towards our outcome statements (Chapter 1). It will also help citizens, planners and decision makers in local communities to understand the impacts of transport on broader outcomes. Over time, the sharing and integration of regional transport, demographic and environmental data can drive the development of technological innovation and community-owned solutions here in Greater Victoria.

As described in Chapter 2, the SSIIC will integrate data to enable two primary use cases: for MaaS and for visualization and analysis. Table 5.1 outlines the data that we plan to integrate into the SSIIC, describing the owner, availability and use case, as well as when we plan to integrate this data (aligned with the Stage Gate approach described in Chapter 6).



Stakeholder workshop on MaaS, privacy and data sharing

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Table 5.1: Data sources for SMP projects (preliminary list)

Owner	Data	Availability	MaaS	Analysis / Visualization	Stage Gate
BC Transit	Transit routes and schedules	Open	☑	☑	1
	Real-time vehicle location	Open	☑	☑	1
	Passenger counts by route	Public		☑	2
	Current fares	Open	☑	☑	1
BC Ferries	Routes and schedules	Open	☑	☑	1
	GPS ferry location	Public	☑	☑	2
	Booking platform	Private	☑		3
Taxis	Real-time taxi location	Private	☑		2
	Booking + payment platform	Private	☑		2
	Number of trips by origin-destination	Private		☑	3
	Travel time from origin to other locations	Private		☑	3
Uber/Lyft	Real-time vehicle locations	Private	☑		2
	Booking + payment platform	Private	☑		2
	Number of trips by origin-destination	Private		☑	3
	Travel time from origin to other locations	Private		☑	3
Modo (Carshare)	Car location map	Private	☑	☑	1
	Booking + payment platform	Private	☑		2
U-bicycle (Bikeshare)	Bike location + real-time availability	Private	☑	☑	1
	Booking + payment platform	Private	☑		2
Capital Region District (CRD)	Cycling routes in Greater Victoria	Open	☑		1
	Traffic counts	Open		☑	1
City of Victoria	Parking locations	Open	☑		1
	Booking + payment platform (ParkVictoria)	Public	☑		2
	Traffic counts + speeds	Open		☑	1
Statistics Canada	Population by census tract	Public		☑	2
	Household spending	Public		☑	2
Municipalities	Employment locations	Public		☑	2
	Community amenities	Open		☑	1
Insurance Company of British Columbia (ICBC)	Licensed vehicles in Victoria	Private		☑	2
Victoria Real Estate Board	House prices	Private		☑	3
Environment Canada	Daily weather	Open		☑	1

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5.1.1 BIG DATA, OPEN DATA AND SHARING

As described in Table 5.1, some of these data sources are readily available as open data. We are prioritizing the use of open data during Stage Gate 1 to deliver an initial product quickly. We will encourage the use of open data and international standards for sharing transport information (such as General Transit Feed Specification, or open data feeds for transit schedules and fares), as this makes our work interoperable, scalable and replicable with other regions across Canada and beyond.

Our projects also rely on public and private data that are not currently open but are owned by transit operators, government or other third-party organizations. In these cases, we are ready to engage and partner with these organizations to enter into a data sharing agreement so that their data can be made openly available to the public. We will also develop data access agreements for third-party organizations who wish to use the data to develop MaaS or other transportation applications as part of the SMP. Citizens, researchers, planners and analysts may also access the data through an appropriate open data license (such as Open Government License or Creative Commons License). Figure 5.1 illustrates the relationship between data providers and consumers from a data and organizational perspective.

By integrating these data sources into a common platform that is open and accessible, the SSIIC will be an invaluable component to the SMP, as it can be used to combine different datasets together to consistently update the MWI and derive new insights into mobility and communities. The SSIIC will house tools for citizens to perform this analysis themselves (Chapter 2), enabling citizen-inspired solutions through innovation and entrepreneurship. Table 5.2 shows a selection of insights that could be derived by combining multiple data sources.

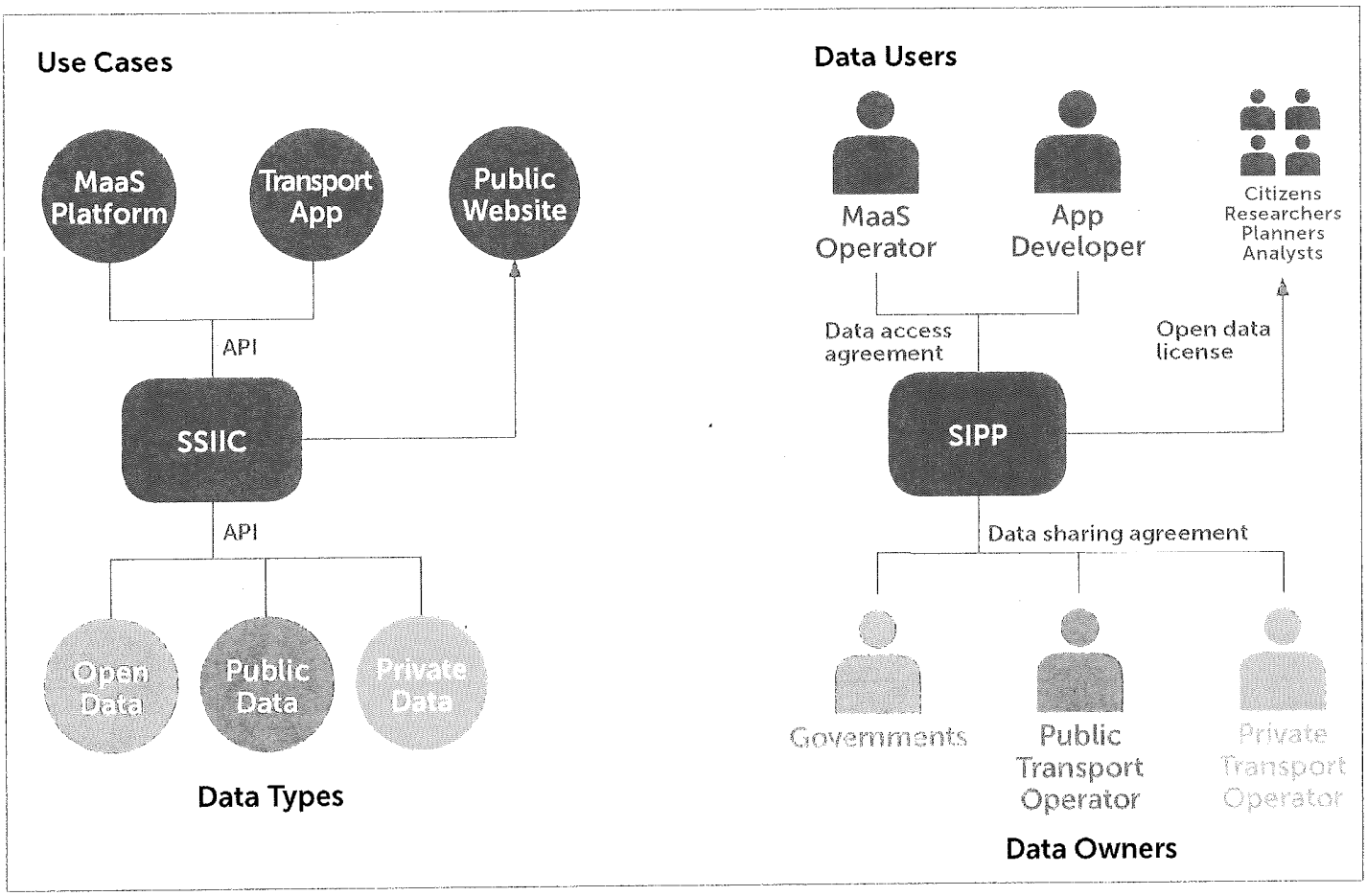


Figure 5.1: Types of data, owners, users and agreements

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Table 5.2: Sample insights generated from big and open data

Outcome	Insight	Datasets
Convenience	Amenities accessible within 30 minutes by transit or cycling	• Amenity locations • Transit routes and schedules • Cycling network
Affordability	Average cost to travel by car or transit to downtown Victoria	• Transit routes and fares • Road network and distances • Average fuel prices
Wellbeing	Mode shift by trips to cycling, walking, transit	• Cycling trip counts • Walking trip counts • Transit ridership by route
Green	Change in car trips compared to current population	• Average yearly daily traffic counts • South Island population
Inclusivity	Jobs accessible within 30 minutes of First Nations reserves by transit	• Employment locations • Transit routes and schedules • First Nations locations

5.1.2 DATA COLLECTED FOR MAAS AND STP

To enable the desired functionality for the MaaS and STP we will collect, store and process personal data (as shown in Table 5.3) in line with our data management plan and policy (described in the following section). We will explain clearly to users why we are collecting their personal information.

5.2 DATA AND PRIVACY PLAN

Having a clear plan and approach to data management increases confidence of users, data sharing partners and the public that their data and privacy will be protected. This section outlines our data management plan, through the lens of all three projects and the MWI. We describe our data policy and principles in line with best practices and outline how these meet the relevant data and privacy legislations within British Columbia and Canada.

The data used within this project will follow these principles:

- Accessible to the public through SSIIC
- Publicly sourced and community-owned (not owned by the private sector)
- Collected, used and disclosed through transparent consent
- Volume of data shall be minimized and de-identified
- Stored and transmitted securely under assurance of effective cybersecurity

Adhering to these principles will support the transferability and replicability of the projects and associated technologies.

5.2.1 DATA TRUST, GOVERNANCE AND OWNERSHIP

A data trust is a mutual organization formed to provide governance, decision-making and oversight on critical issues regarding the management of data. Our data trust will consist of a group of mixed stakeholders, comprised of representatives from the public and private sectors, as well as implementation partners and citizens. This diversity will help keep data policy interpretation open and able to be challenged from different viewpoints. This is also a way of extending control over data to the users from which it is gathered, reinforcing the principle of being community-owned.

The data trust will conduct regular reviews to oversee changes pertaining to individual aspects of the data lifecycle: generation, storage, reuse, redistribution and archiving of data. The outcomes of these reviews are imperative to holding external organizations accountable. The reviews will allow for regular engagement throughout the progression of the three projects and will prevent private-sector ownership, thus maintaining community-owned and -controlled data approaches to publicly sourced data.

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Table 5.3: Data collected through MaaS and STP

Data	Examples	How is this collected?	Why are we collecting this information?
Name	First + last name	Users provide when they sign up for a MaaS account	To associate an account with a person
Credentials	Username + password	Users provide when they sign up for a MaaS account	To allow a user to securely access the service
Contact information	Email address, phone number	Users provide when they sign up for a MaaS account	To enable communication with the user in order to inform of any cancellations to a booked journey, invite to co-design sessions or to inform of updates to terms and conditions or the privacy policy.
Demographic information	Age, user group, preferences	Users provide when they sign up for a MaaS account	To enable personalization of the transportation options and fares (e.g. a lower fare may be shown for seniors)
Location	Trip origin + destination and route	Through the app interface when a trip is booked and via GPS during the duration of the trip	To understand (in aggregate) the travel behaviour and patterns in Greater Victoria and to populate a journey plan/ booking request
Mode choice	Transit versus other options	Through the app interface when a trip is booked	To understand (in aggregate) the travel behaviour and patterns in Greater Victoria and to populate a journey plan/ booking request
Payment data	Debit/credit card or bank information	Users provide when they pay for a trip using the MaaS account	To allow the user to pay for trips directly through the MaaS service and to enable quicker 'checkout' (with securely stored payment token)
User feedback	Trip satisfaction, stated wellbeing	Through the app interface, during or following a trip	To understand how a specific trip affects wellbeing

Additionally, we will appoint a Data Privacy Lead (also a member of the Data Trust) to enforce compliance with privacy regulations. Through this strategy, SIPP will act in the public's best interest and hence build trust.

5.2.2 CONSENT

It is imperative to be transparent when obtaining consent for data. In compliance with privacy regulations, to obtain meaningful consent organizations must inform users of the purpose of data collection, the data retention period, how and to whom the data will be transmitted and, outlined in clear terms, the data subject's rights to the control of their own data (access, erasure, update, etc.).

The strategy involves always pursuing the least privacy-invasive alternative wherever possible, minimizing the data collected, and anonymizing all personal information at the earliest opportunity, while mitigating the potential for re-identification. The data should be used to improve the three projects and the MWI and will only be stored for as long as deemed necessary for improvements or updating of the initiatives outlined in our initial SCC proposal.

We will hire a third-party company that is highly competent at anonymizing collected data and ensuring the anonymized data containing Personally Identifiable Information (PII) cannot be re-identified when disseminated. We assume that existing data outside of our ownership and collection complies with privacy regulations as appropriate.

The open data policy invites the public to contribute data through openness and transparency. This data will be used to drive community-owned solutions such as MWI and inform strategic and regional plans.

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5.2.3 SECURITY

Cybersecurity is a critical component of the MaaS and SSIIC platforms, which involve PII. Within the SMP, users can expose their PII knowing with confidence that it 1) is only being accessed by trusted and vetted third-party partners, 2) is encrypted and 3) is accessibly only through two-factor authentication.

Our system will deploy security solutions through the following methods, which address trusted vendor and customer relationships, encrypted PII and human error:

1. Trusted suppliers and customers: Third parties will need to have access to our data platform to create and deliver value to the citizens of Greater Victoria. Traditional security solutions using IP-based identification have been proven by cyber criminals to be easy to defeat. SIPP will implement a DNS firewall that our networks can only communicate with the domains of trusted suppliers and customers on an established domain white list. Everything else will be blocked.

2. Encryption triad: There are three stages of data encryption: 1) at rest, 2) in transit and 3) in use. SIPP will work to implement all three phases of encryption of the PII data. Nation State attacks are usually successful when data is In Use. Until recently, processing power and technology has been a limiting factor for In Use encryption. With the emergence of Homographic security, SIPP will ensure that In Use data is always encrypted.

3. Multifactor authentication (MFA): Google and European banks have mandated the use of MFA. Humans are the greatest risk to a network, and MFA prevents credential theft from occurring. For example, users must complete a login process by entering a code sent to their mobile phone.

Beyond the technical elements of our privacy protection scheme, the Data Privacy Lead will ensure all attempted breaches are reviewed to continually monitor our security profile.

5.2.4 DATA AND PRIVACY REGIMES

As SIPP is a NFP organization within British Columbia, we are regulated by the BC Personal Information Protection Act (PIPA). This act balances individual rights to protect personal information with an organization's need to collect, use or disclose it. We have developed our data management plan to meet this standard (5.2 Data and Privacy Plan). Within Appendix 2, we include our preliminary Privacy Impact Assessment (PIA), which was prepared in consultation with the Office of the Information and Privacy Commissioner for BC.



Only trusted third-party partners will have access to users' PII.

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Table 5.4: Data privacy principles and our plan for compliance

Privacy principle	How will we comply?
Accountability	The Data Privacy Lead will be responsible for compliance with applicable privacy legislations, as well as for handling access requests and privacy complaints. We will make the name and contact information of this individual public.
Identifying the reasonable purpose	We will identify the reasonable purpose for the collection, use or disclosure of personal information that is required to deliver the services developed for the projects. We will use clear, understandable language to notify individuals of the purpose.
Consent	We will clearly and concisely notify users of the purpose of data collection through an easy-to-understand privacy statement and end-user license agreement. Individuals will provide express consent (through the website or app) prior to using the service and can withdraw consent at any time.
Limiting collection	We will ensure that the information collected will be limited to the purposes identified before or at the time of collection.
Limiting use, disclosure, retention	We will limit the use, disclosure and retention of personal information to what has been consented to or to what is allowable under PIPA. We will notify and request consent from individuals should the purpose change. We w ill limit retention for as long as required. This will be reviewed by the Data Trust.
Accuracy and correction	The collected personal information will be kept accurate, complete and up-to-date as possible to satisfy the purposes for which it is collected. We will correct errors or omissions to personal information as requested by individuals. We will provide users with the ability to update their own profile.
Protection and safeguards	We will build data protection into the core design of all systems, rather than as an addition at a later stage. We will use state of the art data anonymization methods such as differential privacy, geomasking, and k-anonymity to preserve privacy throughout the collection, storage, and use of all data containing PII.
Individual access	An individual can challenge or amend information as appropriate. The individual can also be informed of the existence, use and disclosure of personal information and given access per request. We will provide an electronic copy of personal data and/or any supplementary information to participants as requested.
Challenging compliance	We will provide a simple form for users to communicate any questions, concerns or complaints related to their personal information. An individual may complain to the Office of the Information and Privacy Commissioner should we fail to meet our obligations. We will cooperate with the Commissioner's Office.
Openness	We will ensure our policies and practices relating to the management of personal information are publicly and readily available through web platforms and apps. Citizens can also request information from our Data Privacy Lead.



We will engage citizens in 'hackathons' to help develop solutions for problems identified by data in the SSIIC.

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5.3 RISK MITIGATION

Table 5.5: Risk mitigation strategies

RISK	MITIGATION STRATEGIES
Loss of public trust or negative public perception over nature of data openness uses related to projects and data privacy standards	We have developed an engagement plan to keep the public informed and engaged along the journey (Chapter 4). The co-design process ensures that touchpoints and processes both comply with legislation and best practice but also produce trust and confidence in users' terms. Each service will have a unique set of Terms and Conditions and a privacy policy (which conforms to the applicable data protection laws of the operating country) with the co-design group helping to ensure these terms are accessible and understood by the target audience.
Vulnerability against breaches, damage as a result of potential data breach	Enforce data sharing partners (municipalities, industries, mobility service providers, etc.) to be compliant with the applicable regulation. The data-trust is will be independent, treating all parties equally, and will conduct thorough reviews for robustness of partner companies' cybersecurity policies, processes, procedures and readiness.
Possible re-identification of data	Hire a third-party company who is highly competent at anonymizing collected data and ensuring anonymous PII. The data-trust plans to incorporate or adhere to new data privacy standards, tools and practices as they emerge, which could include incorporation of self-sovereign identity or blockchain authenticated identity.
Security of collected PII data	Implement physical, administrative and technical safeguards to minimize access to personal information. This includes the separate storage of data by classification into a tiered system. Access will only be provided to individuals as required for the identified purpose of delivering the services.

CHAPTER 5 LINKAGES TO OUTCOME THEMES



Convenience

Access to open and big data makes MaaS solution more convenient for users



Wellbeing

Data from transport operators, combined with other civic data sources in the SSIIC, will provide input into the MWI, which allows us to monitor progress towards our outcome statements

Data will be used to drive community-owned solutions such as MWI and inform strategic and regional plans



Inclusivity

The SSIIC will house resources for citizens to perform this analysis themselves enabling citizen-inspired solutions through innovation and entrepreneurship

The open data policy invites the public to contribute data through openness and transparency

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CHAPTER 6
Project Management

"It's a bad plan that admits of no modification."
– Publilius Syrus

6.1 INTRODUCTION AND APPROACH

Complex, innovative projects with sub-projects and multiple stakeholders can deliver breakthrough results. At the same time, they are also subject to a host of challenges such as schedule slip, insufficient customer connection and coordination challenges between stakeholders and siloed sub-projects.

To avoid these issues and ensure success, we will employ aspects of the Scaled Agile Framework (SAFe) to our projects. The SAFe approach promotes alignment and collaboration between teams and stakeholders, which in turn helps ensure our desired outcomes for the design and implementation across the three project teams. It applies lean innovation concepts and ensures early and frequent customer involvement, rapid and continuous iteration and validated learning through constant end-user engagement and iterative design.

As an innovative addition to SAFe, we have developed an Outcomes-Based Project Feedback Loop (Figure 6.1), which combines a Stage Gate approach (divided into key milestones in program delivery and evaluation) with SAFe principles.

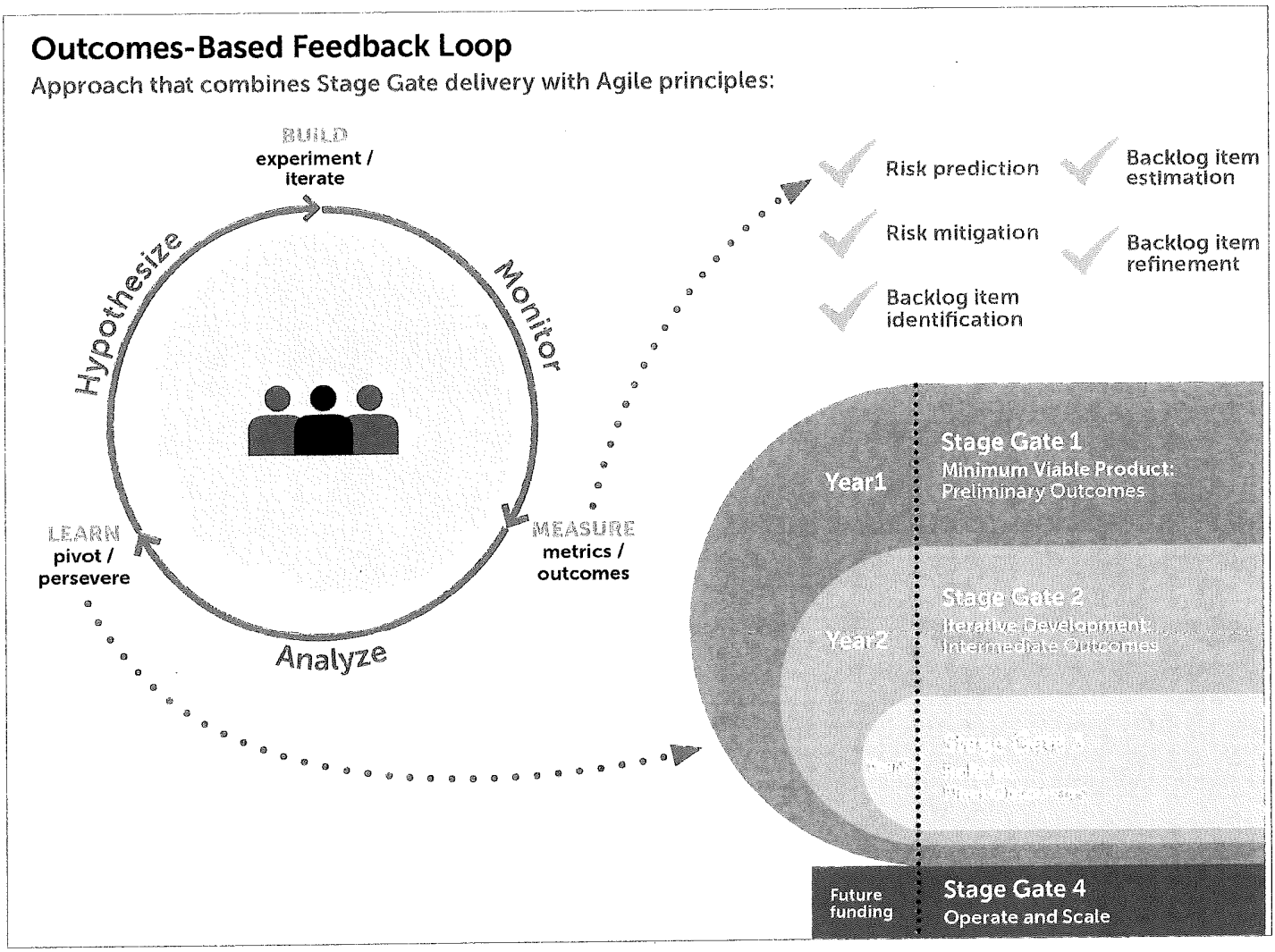


Figure 6.1: Outcomes-Based Feedback Loop

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This ensures we deliver frequent releases to our customers, while also ensuring we deliver on our longer-term program outcomes. This concept will be further elaborated below.

6.1.1 PROGRAM MANAGEMENT OFFICE

To manage the SMP we will establish a Program Management Office (PMO). The PMO will run quarterly sprint review and planning sessions to discuss project progress to ensure alignment across the three project teams around agreed outcomes for the next quarter. These sessions will bring together the three project teams, along with the key stakeholders, to both review and align design and development and to plan the next iteration. This protocol will help to manage risk and dependency between the projects. To successfully deliver, we will incorporate the following into our project plans:

- The full range of services/functionality to be delivered in each project
- The dependencies that exist between the projects, highlighting the critical path
- Technology and non-technology deliverables
- Resource needs and readiness for human resources, assets/materials and workforce capacity
- Any related initiatives already underway
- Management of the key stakeholders, delivery partners and the procurement process
- Reporting and communications plans to ensure individual projects are on track
- Risk management to work through known risks and use our Stage Gate and iterative design approach to identify and mitigate unknown risks

We will run a series of sprint reviews to demonstrate progress at each quarter to all stakeholders. In the early stages, these sprints will be vital to developing the minimal viable product (MVP), providing the teams with quick progress updates to decide to continue on the current path (persevere) or to review and reassess our concepts (pivot). Each project team will provide its product demonstrations in the same session, breeding cross-team alignment, early identification of risks, budgetary impacts and dependencies, as well as effective communication with stakeholders, the PMO and the Steering Committee.

This hybrid project management framework (SAFe with the Outcomes-Based Feedback Loop) builds consensus in advance at planned stages; each Stage Gate is delivered as an increment of the overall program, with a unified outcome in mind. Through regular iterative rollouts, the project teams will expedite development and improve predictability for future iterations.



Our PMO and Steering Committee will run quarterly sprint reviews.

6.1.2 CITIZEN-INSPIRED TRANSFORMATION

We recognize that 'no business plan survives the first encounter with the customer' as a warning that our process must maintain the customer at the core of our project management process. In fact, our motto "Citizen-Inspired Transformation" compels us to ensure that we hold this ideal true in all our actions—from engagement, vision setting and, of course, project management.

We will honour these commitments via our dedication to co-design target groups (through workshops, user story mapping and beta testing) to ensure that customer-valued features will be prioritized. As the costs of a missed feature increase exponentially through a project's lifetime, we expect to build quick, learn quickly and adapt quickly, which will ultimately pay dividends downstream as we scale to larger audiences. Hence, we have chosen three co-design target groups to focus on, deliver value, and ultimately move to adjacent, broader groups and applications.

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While some components of our projects will allow for direct connection to customers in real time, many others will require beta group feedback with selected group of advanced customers. This high-trust relationship helps ensure that new project features, systems, and services can go through early testing and evaluation in advance of broader release.

At key points in the project (major release cycles), we will lock features and capabilities to create the deliverables and functionality at each Stage Gate. This will provide the project management team a chance to analyze and measure outcomes, with a view to either pivot or persevere with the design and functionality.

The diverse set of professional skills required to deliver these projects is a significant resource requirement. We will need project team resources as well as engaged stakeholders and community members to participate in pilot programs. We will manage these resources through a rigorous stakeholder analysis, which identifies the resources available (people, assets, intellectual property, technology and non-technology functions) and how they can be best deployed in the development of the projects.

Through our robust partnership network, we have identified qualified resources and partners for all aspects of the project. We will engage in open procurement processes to secure the best resources and best-in-class solutions, while maintaining the strongest attention to the key attributes of the projects: open data models, open technology frameworks and sustainable and transferable solutions. At the same time, we are not beholden to any one specific path or partner and can therefore pivot from one supplier to another if required.

6.2 SCOPE, SCHEDULE, SEQUENCING AND DEPENDENCIES

The scope of the three projects that comprise the SMP are detailed in the Vision and Technology chapters. Table 6.1 outlines the level of functionality that we plan to achieve and deliver by the end of each Stage Gate. The outputs delivered in the first Stage Gate are initially limited in functionality, as during Stage Gate 1 we will deliver a minimum viable product. We will take lessons learned from users and the co-design target groups to deliver new functionality and scale to more markets within later Stage Gates.

Concurrent with this work, we will also develop the guidance documents with best practice, templates, and materials to formalize our learnings and serve as a basis for knowledge transfer and scaling across Canada, as discussed in Chapter 2. Specifically, we will develop an MWI Toolkit, Co-design Toolkit, and MaaS Guidance. These will be delivered once key supporting project workstreams have been completed.

Table 6.1: Technology scope by Stage Gate

STAGE GATE	1	2	3
Project 1: Integrated MaaS	Co-design requirements (services and tools); build, beta test and Indigenous Smart Mobility Pilot.	Increase users; Increase functionality; Quarterly releases based on ongoing co-design and feedback; New mobility tools designed and delivered.	Consolidate learnings; Upgrade platform and service in line with emerging SMP co-design target group requirements. New features and markets
Project 2: Smart Trip Planning	Trip-planning microservice.	Integration with new third-party data to deliver new functionalities	
Project 2: Single Payment Platform	Integrated pricing information; payment microservice.	Payment microservice; MaaS stored account API; Payment for specific modes via one stored balance account.	Multiple-payment API; payments to multiple operators via a range of interface options.
Project 3: SSIIC	Integration with Stage Gate 1 data sources; API gateway; prototype open-data website with visualization tools	Integration with Stage Gate 2 data sources; open data website with visualization and analytics tools	Integration with Stage Gate 3 data sources; open-data website with visualization analytics, and simulation tools

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We have partnered with BC Transit and CUTA to help disseminate information to municipalities and transit agencies across the province and Canada.

6.2.1 SCHEDULING AND CRITICAL PATH DEPENDENCIES

In our schedule (Figure 6.2), we identify the timelines for four Stage Gates. The first three Stage Gates are covered by the SCC funding. After Stage Gate 3, we plan for our solutions to be sustainable locally (through revenue generation) and scalable across Canada.

Our workplan strategy for MaaS is to rapidly begin co-design for the Indigenous Smart Mobility Pilot, working with Indigenous students to determine the needs and requirements for a MVP within the early sprints of Stage Gate 1. We will then deploy the service, learn and begin co-design of the MVP for our seniors co-design target group. At the same time, we will re-enter co-design and development on expanded set of features for Indigenous Smart Mobility Pilot. This process will then be repeated for the new employees co-design target group as well. We will be constantly refining the service offering and expanding to more users.

Similarly, the workplan strategy for the earlier sprints within Stage Gate 1 for the STP and the SSIIC will be to develop the microservices and integrate the data sources that support the delivery of the MaaS

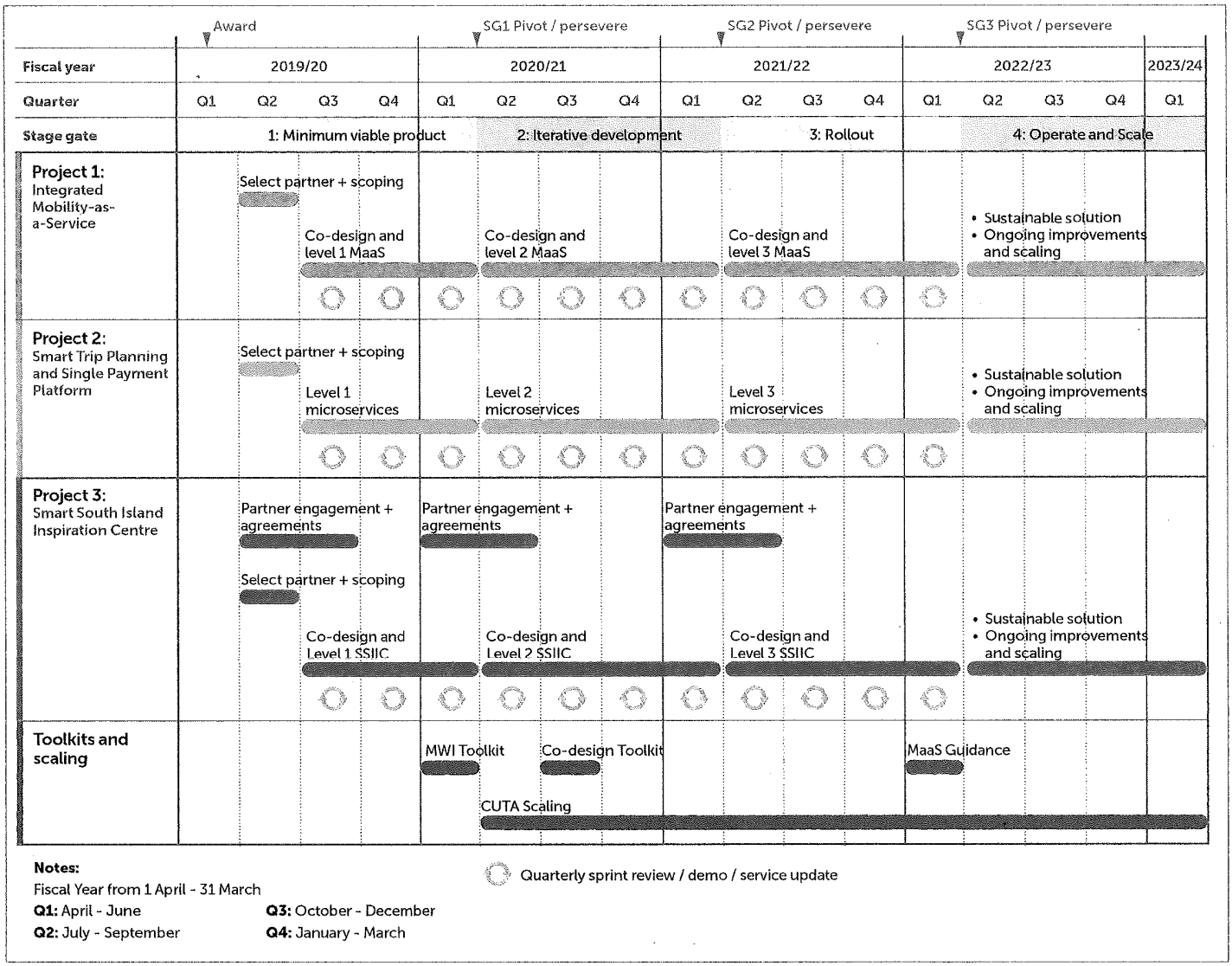


Figure 6.2: Project activity schedule

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Table 6.2: Critical path dependencies

Critical path activities for Projects 1, 2 and 3	Critical path dependencies between projects
• Stakeholder analysis and engagement • Scope definition • Project plan • Budget creation • *Co-design sessions* • Requirements gathering - Technology requirements - Functional requirements - Non-functional requirements • Functionality levels per sprint • Disaster and recovery plan	• Technology, functional, and non-functional requirements needed to be considered between all projects • Data elements/strategies required for personal data (between Projects 1 and 2) • Data elements/strategies required for transit, traffic and public data (between Projects 2 and 3) • Functionality levels for all projects per sprint and per pilot • Stage Gate deliverables that align functionality (between Projects 2 and 3)

services. Once these have been established, the buildout and delivery of the key components runs in parallel between the major projects, as shown in Figure 6.2.

With the scope defined for each project, the following critical path dependencies need to be considered by our PMO and product owners, as shown in Table 6.2.

Identifying and mitigating the impacts of schedule deviations are key determinants in a project's success or failure. Our development approach helps to drive innovation (since solutions are not prescribed) and provides transparency on progress for early decision-making based on tracked KPIs in our sprint reviews sessions. Adequate contingency planning from both delivery and budgetary perspectives at the outset is critical to minimizing the impacts of project plan slippage.

With this schedule and strategy, we will complete a regular stream of major public-facing deliverables (Stage Gate releases) that will be relevant to the public and to stakeholders and demonstrate progress on SCC outcomes (as captured by the MWI, detailed in Chapter 7).

6.3 RESOURCING

6.3.1 STAFFING

We have identified multiple groups and specific resources to comprise our core team (Table 6.3 and Figure 6.3). To deliver these skills, SIPP can draw on a wide range of organizations (regionally and globally) to complement its existing team structures.

Beyond the core team structure, SIPP will rely on its P3 governance model (Chapter 3). The P3 model is a critically important element of project management, as the project Steering Committee will be made up of members from diverse mobility stakeholders. Our governance is perhaps the most important factor in a successful delivery, as the most common reason for large system failures comes from lack of full buy-in and support from top-level stakeholders. SIPP's model is designed specifically for this purpose.

6.3.2 INFRASTRUCTURE READINESS

To support the quick start and delivery of the Indigenous Smart Mobility Pilot, we have begun identifying an inventory of assets (such as community vehicles), as well as travel information (including origin-destination, trip frequency) about the potential riders. This work has been started with our First Nations communities, groups, and education centres such as Songhees Nation, Sc'ianew Nation, Saanich Adult Education Centre, and W̱SÁNEĆ School Board, who have vehicle assets that are available for use within the Indigenous Smart Mobility Pilot. This demonstrates a major element of the projects' infrastructure readiness and contributes to the 'quick wins' element of our approach to project delivery.

Community engagement and collaboration was the key to bringing together and coordinating the sharing of assets amongst multiple First Nations communities and education facilities. This inclusive approach

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Table 6.3: Core team roles and responsibilities

ROLE	RESPONSIBILITIES
Program Director	• Reports to the CEO, ensuring that projects remain on track from a scheduling, resourcing, dependency, budgetary and functionality perspective
Technology and Development	• Manages the digital architecture including the technical requirements to deliver three projects • Coordinates the research and development roadmap and liaises with product owners
Data, Security and Privacy	• Engages with third-parties for data sharing and data access agreements • Responsible for compliance with the PIPA and handles all inquires relating to data privacy
Planning, Monitoring and Evaluation	• Measures performance and monitors our progress towards outcomes • Responsible for project controls and reporting
Community and User Engagement	• Coordinates and facilitates co-design sessions and user engagement to guide development of project • Provides customer support • Coordinates internal task forces and key stakeholder groups
Marketing and Communications	• Provides inbound marketing to project teams • Provides outbound marketing for the projects

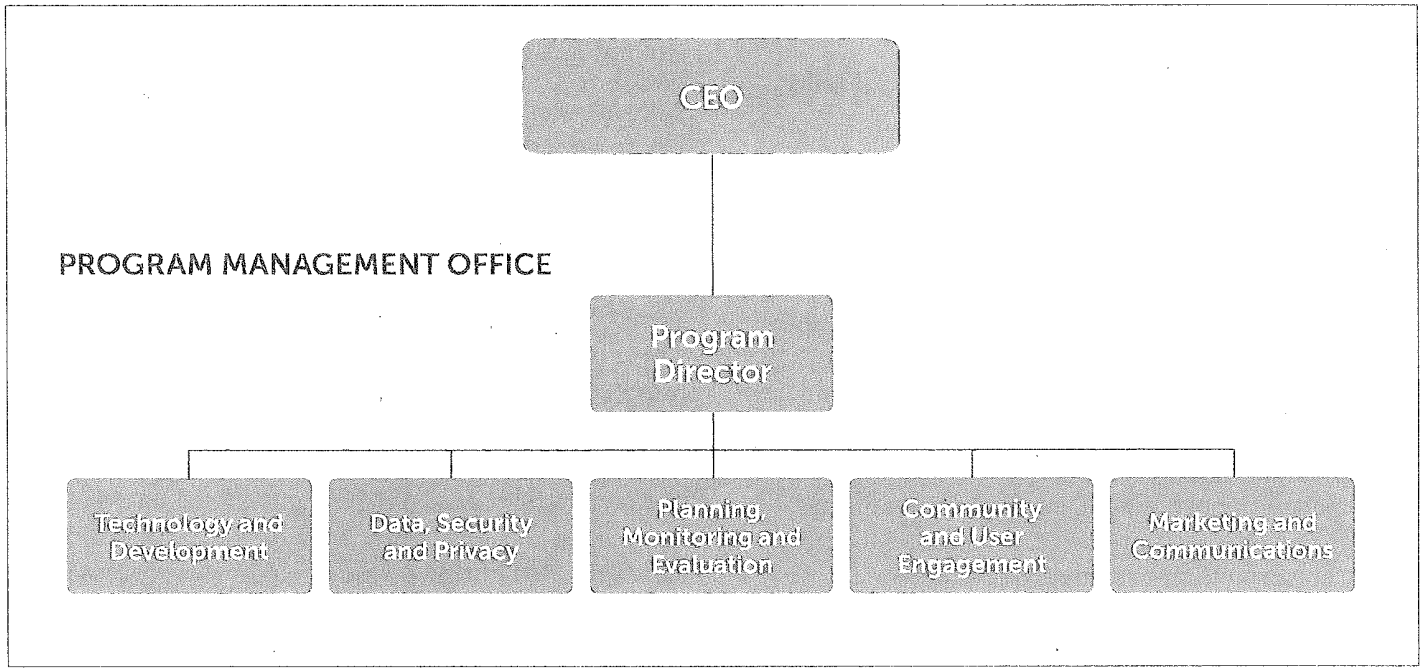


Figure 6.3: SMP project management

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has never happened before for these groups and demonstrates that SIPP's P3 model can bridge the gap between the communities and their mobility needs.

Through our partnership with BC Transit, we have been able to secure driver training services. This is vital to the operation and success of the Indigenous Smart Mobility Pilot and provides employment opportunities and benefits to the communities involved, further demonstrating the positive impacts achievable through this pilot project (refer to Chapter 8 – Implementation for Community Employment Benefits).

As noted in the Chapter 2, the Indigenous Smart Mobility pilot will keep costs low by utilizing existing assets – both from a vehicle and people perspective. This approach ticks several boxes:

- Low cost;
- Low barrier to access and use the service;
- Employment opportunities; and
- Better transit services to those that need it most and is easily replicable and scalable.

Our research associated with the Indigenous MaaS pilot led us to the Preston model, which promotes community wealth building. This model mirrors our approach to the Indigenous MaaS pilot as it seeks to build a collaborative, inclusive, sustainable framework to support the local economies. This pilot can draw from lessons learned through the establishment of the Preston model by seeking to improve employment (through driver and operator employment opportunities), housing affordability (by improving transit options and reducing the need to live closer to high-cost areas). It also reduces reliance on public funding by reinvesting back into the communities.

With our partnerships, the projects will have access to key resources, including transportation planners and analysts at BC Transit, to assist with service and route planning, pickup/drop-off zones and schedule integration.

6.3.3 FINANCIAL

The financial management of the three projects is a key consideration not only for the grant funding but also to manage aligned funding contributions from our partners. Further to this, budget and financial management practices will be integrated into the PMO responsibilities to ensure strong attention to financial performance to plan throughout the project. Please refer to the Appendix 1 for further information.

6.4 STAKEHOLDERS

As we develop the concepts and teams for each project, we will conduct a stakeholder analysis to understand exactly what each key stakeholder's interests, expertise and investments are across the projects. This analysis will help to measure the success of each stage of the project to ensure that the work being conducted is meeting the needs of those stakeholders as well as the objectives of the projects and overall SMP. This can be achieved regularly through the quarterly sprint reviews and product demonstrations.

An early stakeholder analysis will help to inform where opportunities and gaps lie in our partnerships, further enhancing our goal to be nimble with our procurement policies. Please refer to Chapter 4 for more information.

6.5 PROCUREMENT PLAN

These projects naturally require the coordination of resources and oversight from many private and public organizations. Bringing these worlds together requires a P3 structure to be built and managed. SIPP has already developed and proven (and gained international recognition for) this model. Procurement will be open and transparent, using public procurement processes with a clear line of sight toward the main outcome statements of the projects. SIPP will not be beholden to one technology or technology provider. Rather, it will favour open technologies in all procurement activities, allowing for maximum flexibility and transferability in our solutions.

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6.5.1 PARTNER AND VENDOR SELECTION

We plan to tap into the leading expertise, design and products that have already been developed and tested. This will allow us to develop quick wins and complement our Stage Gate delivery and agile approach for the three projects. Our structure as a private NFP supports this approach as it allows for innovative procurement approaches while maintaining openness and transparency.

To achieve this, we will use an adaptation of the industry standard IT Infrastructure Library (ITIL) framework in vendor solicitation. The framework, in brief, consists of having a clear view of outcomes, objectives and requirements; creating a requirement evaluation matrix; a market scan, and an evaluation of vendor offer against the requirements.

6.5.2 VENDOR ENGAGEMENT

Once a vendor is selected, we propose using an iterative engagement model. Traditional models assign large contracts and scope under a single static engagement where vendor performance measurement is difficult, and the contract is seen through to its conclusion, with no significant adaptations to changing conditions.

The iterative approach divides projects into distinct parts, with evaluation and feedback processes along the way, including progression of scope and budget approvals. By using this approach can also include an evolving scope framework, with detailed scope for early phases of the project and more indicative scope for later phases with leaner requirements. Iteration allows for better risk management and course correction based on real-time vendor delivery performance and aligns well with the Stage Gate process.

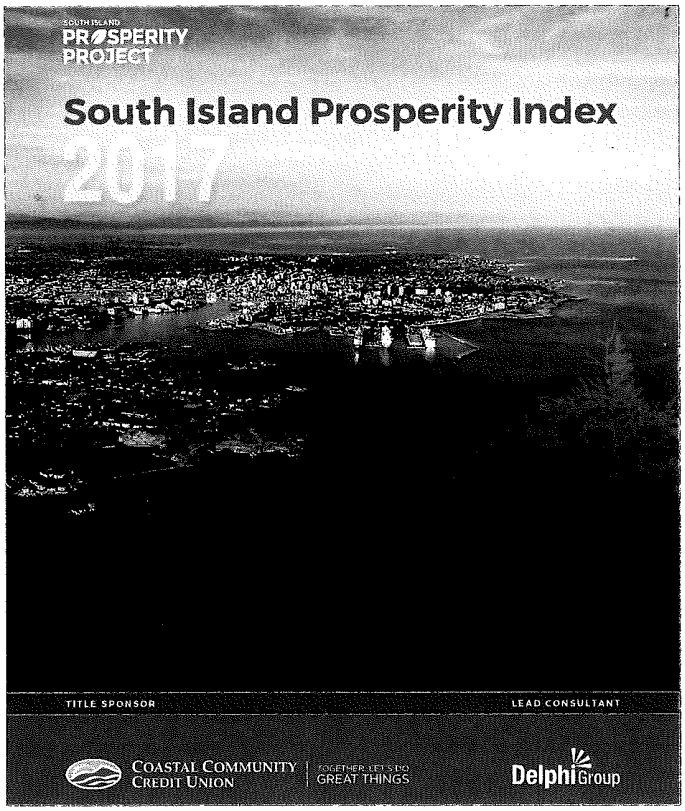
6.6 COMMUNICATIONS

Regular feedback between projects is a key component of the development process. It is not an adjunct function to be completed at the end of the cycle. By using techniques such as early beta trials and paper workflow prototypes and following customers in their daily journeys (surveys and feedback captured through the MWI), we will develop a growing understanding of our customers' mobility needs throughout the development process. While the main project advocate for the customer will be the Product Manager, it is expected that all project members will have an intimate knowledge of their customers.

Beyond the specifics of project communications, there will be a consistent strategic communications plan delivered to communities. This, coupled with the outputs of the SSIIC, will give the broader community a good sense of 'what is going on' with the program throughout development. Engagement activities already completed in advance of this finalist submission—including social media, innovation events, showcase events—will continue as well.

6.6.1 REPORTING STRATEGIES

Regular monthly reporting from the PMO to the Steering Committee will ensure traceability from both a deliverable and budgetary point of view. This level of reporting accountability helps to identify and mitigate unknown risks and keeps the key stakeholders engaged through the design and development stages.



Each year SIPP releases the South Island Prosperity Index, which measures the region's competitive position among the five themes.

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We will have quarterly reporting with our sprint reviews to describe activities carried out, lessons learned with end-user feedback and planned activities for the next quarter across all three projects to maintain the required alignment. Additionally, the MWI is designed to be a dynamic, public-facing tool that engages users in what's possible with a bolder, smart mobility future.

6.7 SUSTAINING PROJECTS BEYOND THE CHALLENGE

Beyond the lifecycle of the SCC, we will work to sustain projects over the long term. Our vision for the evolution of MaaS is to progressively expand to more user groups and wider geographies across Greater Victoria, as well as and supporting expansion across Canada with our learnings and products. Our intent for Projects 1 and 2 is to develop the service and business models that can create revenues streams directly related to the value added by the SMP (Appendix 1).

As discussed in Chapter 5, our approach to data and privacy means that we will establish a data trust to govern and sustain the SSIIC digital platform (Project 3). We see the SSIIC digital platform as the foundation for a civic data marketplace (beyond transportation data) that provides value for both government and private organizations. Our intent through the development of the SSIIC is to build institutional capacity and explore revenue models with the data trust to enable sustainable operation and, over time, become a physical, interactive mobility lab.

6.8 RISK MITIGATION

6.8.1 APPROACH TO RISK MANAGEMENT

There must be a systematic approach to risk management and mitigation assuming at least the following steps:

- Identify known risks and predict potential risks
- Assess and analyze the probability and impact
- Plan to action to mitigate and minimize the risk(s)
- Implement the plan to ensure the risk has minimal impact on the project
- Monitor, measure and control the risk

6.8.2 RISK MONITORING

Establishing a risk register will help to collect and organize the risks into categories to help with the management and mitigation processes. Categories will be defined in conjunction with the PMO, stakeholders and project teams but an early framework would include

- Customer and stakeholder alignment
- Project management (scope/time/cost/quality changes)
- Resources and team (skills, availability)
- Technology and system architectures
- Change management
- Financial (procurement, expenses, contribution management)
- User adoption and feedback
- Data privacy and security

Our strategy for managing these risks will align to our outcomes and KPI's to measure the impacts those risks may have, as well as targeted decision making to resolve them. Any new risks will be raised, reviewed and ranked as part of the quarterly sprint reviews and will roll up into the monthly reporting by the product owners to the PMO and Steering Committee. Any existing risks that have been previously identified and are on the risk register will require review and ranking as well as mitigation measures and plans to address.

Table 6.4 provides a high-level overview of project management related risk, while project or issue specific risks are identified in each chapter of this submission.

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Table 6.4: Risk mitigation strategies

RISK	MITIGATION STRATEGIES
Lack of executive support or change strategy	Refer to Chapter 3
Lack of stakeholder or public engagement	Refer to Chapter 4
Technology risk	Refer to Chapter 2
Filling the required core project resources	Greater Victoria has a rich talent set for partnership project management and technical development. SIPP will draw on its member organizations for additional support if required.
Unforeseen technical/logistical risks identified late in the project	SIPP has a broad network of partners and subject matter experts to draw upon. If/as new issues arise, this network can be brought into the projects on an as-needed basis. Open architecture also increases the responsiveness to these risks by ensuring flexibility.
Lack of integration and coordination across projects	Our PMO structure and outcomes-based approach is specifically designed to mitigate this risk
Projects do not follow described schedules	Through Agile methodology, coupled with formalized Stage Gates connected to key outcomes, the projects will have strong, early notification of any possible slippages. Remediation actions will be developed and tracked by the PMO.
Requirements are insufficiently designed	Requirements definition is a critical element to any project's success. They must be clear, complete, unambiguous and well aligned to the strategy. The key to strong requirements is a robust design and governance model, and formalized requirements change management and approval process. While the process can be agile, it must be structured and clear. We will deploy formalized board of change and change management practices within our PMO
Delays in schedule as a result of procurement model	SIPP has begun the vendor engagement process and expects to finalize a detailed procurement policy and strategy ahead of the grant award so that we can rapidly transition into execution upon award.
Lack of continuity of program and pilots after grant funding ends.	We are designing our SMP to sustain it over the long term, including how the projects transition to sustainable service and business models and how the SSIIC develops into a physical space. SIPP's funders have expressed strongly that smart mobility is a key, long-term, region-wide priority.
The projects drift from the real customer needs	Customers will be integrated in the project through the rapid sprint cycles in the agile process starting with the co-design target groups. Feedback will ensure the customer is continually validating the project outputs.

CHAPTER 6 LINKAGES TO OUTCOME THEMES



Convenience

Travel information (origin-destination, trip frequency) about the potential riders improves convenient travel options



Affordability

The Preston model addresses housing affordability and reduces reliance on public funding

Using existing assets keeps costs down and obviates major initial investment required to kick-start the Pilot



Wellbeing

We will develop an MWI Toolkit, Co-design Toolkit, and MaaS guidelines to help measure wellbeing



Inclusivity

Community engagement and collaboration was the key to bringing together and coordinating the sharing of assets amongst First Nations communities and education facilities to ensure inclusivity

Steering Committee will include diverse mobility stakeholders

SAFe and Stage Gate approach ensures continual community/end user engagement

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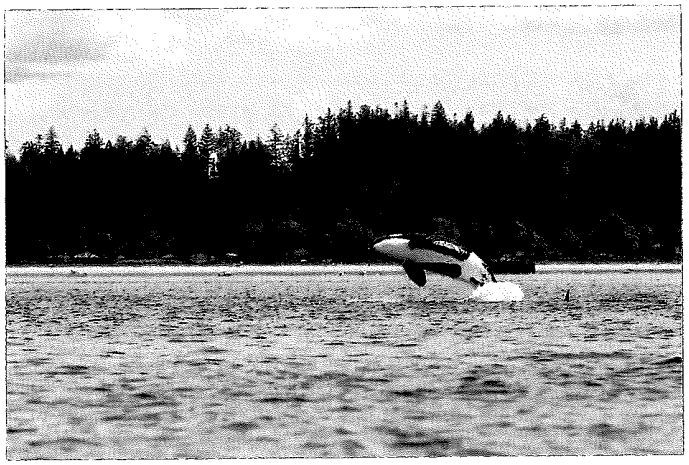
CHAPTER 7
Performance Measurement

"Not everything that can be counted counts, and not everything that counts can be counted."
– Albert Einstein

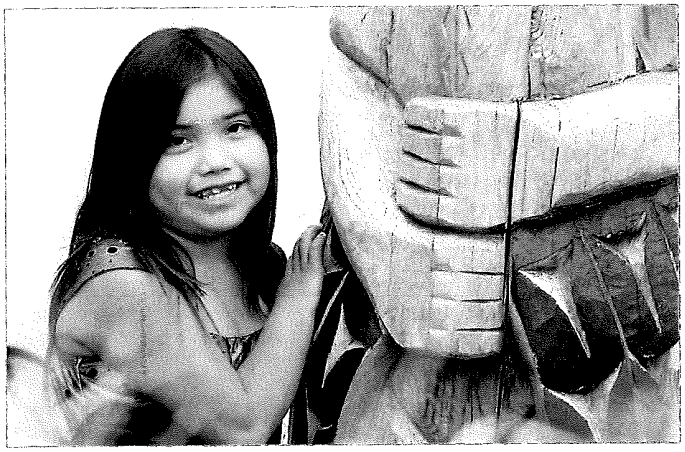
7.1 OUTCOMES-BASED PERFORMANCE MEASUREMENT FRAMEWORK

A well-defined performance measurement framework is vital to monitoring project operations and outcomes. It embeds a validated learning approach into our overarching SMP and projects. SIPP uses a results-based management approach, creating alignment from vision to our intended results, while expressing the explicit linkages among planning, evaluation and reporting processes. This chapter details our Mobility Wellness Index, described in the following section. We then discuss the specific outcome statements, indicators and a monitoring plan for each of these areas.

Our performance measurement framework maintains laser focus on the overarching challenge and outcomes statements, supported by project-level inputs, activities and outputs. The framework provides insights to key stakeholders on progress toward desired outcomes at select intervals, which offers critical data to support validated learning and decision making (such as incremental investments in successive product development cycles). It complements this with an engaging and visually compelling public-facing reporting dashboard: the Mobility Wellness Index.



To have a positive environmental impact, we will ensure that our multimodal transportation network is green.



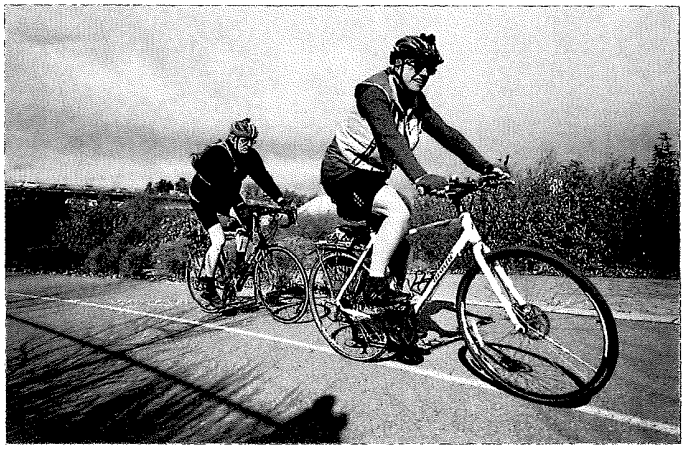
Inclusivity is essential to ensuring that even the most vulnerable populations have reliable and convenient mobility options.

As outlined in Chapter 1, our challenge statement is "We will collaboratively create a multimodal transportation network that is convenient, green and affordable, boosting South Islanders' Mobility Wellness score by at least 20%."

We will measure our progress against this statement to achieve five key outcome themes, which we have identified through engagement with stakeholders and the public: convenience, affordability, wellbeing, green and inclusivity. Since our initial proposal, we have added 'inclusivity' as our fifth outcome statement. We have added this based on our community engagement, which revealed how transportation can be a challenge for low-income and other vulnerable residents. This additional outcome statement allows us to monitor the impacts of projects for these co-design target groups.

We outline our three-year outcomes-based performance measurement framework for the SMP in the following subsections. Full details will be published on our website (www.southislandprosperity.ca) on March 11, 2019. The report on the MWI will be available on our website March 16, 2019, and the more holistic South Island Prosperity Index (2018/19 edition) will be published on our website on April 30, 2019.

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Cyclists ride on the Galloping Goose Trail.

7.1.1 MOBILITY WELLNESS INDEX

The Mobility Wellness Index (MWI) is the first performance measurement system designed to meaningfully measure the effects that mobility systems have on the physical, emotional and financial wellbeing of their users. The MWI is a composite score based on regional performance across 20 indicators. It is informed by 40 metrics derived from six theme areas – five of those themes are our outcome statement themes noted above, and an additional theme is Policy and Governance. Progress will be measured relative to the composite score, which will increase as a result of investments and improvements to mobility systems (in Greater Victoria's case: the Smart Mobility Program).

The MWI was developed over many months and iterations through SIPP's work with Arup, Happy City, a taskforce of city leaders, transit planners, psychologists and social health experts, and supported through stakeholder interviews and extensive international literature and program review. While Greater Victoria offers an ideal testing ground to pioneer this advance in transportation performance measurement, we already have MWI partnerships with the City of Montreal, Smart Columbus, CUTA, and others to ensure the design of the MWI can be scaled and replicated to other cities across Canada and the world.

The MWI composite combines different themes, indicators and metrics—including both quantitative and qualitative data—that indicate progress resulting from investments and improvements to mobility systems. The MWI is shown graphically as a polar diagram, as seen in Figure 7.1. This diagram offers three critical layers of information for monitoring our progress:

Themes are represented in the inner layer closest to the centre of the circle. There are six themes: one for each outcome statement, plus a sixth, labelled Policy and Governance (relating specifically to how governments are developing and implementing policies and programs that help improve wellbeing).

Indicators are associated with each theme on the outer layer of the diagram. There are 20 indicators, each forming a slice within the polar diagram. These are linked to specific goals and sub-themes listed under each outcome statement. For example, the Greener theme has resource efficiency, cleaner air, and citizen engagement indicators.

Metrics are the data that produces the score for each indicator (located as the middle layers of the circle). The score for each indicator is represented by a coloured location within each indicator slice. Indicators that are performing poorly will have a coloured location closer to the centre of the circle, whereas indicators that are performing well will have coloured location closer to the outer layer of the circle. These are measured either in quantitative or qualitative form and scored as averages to inform indicators.



Seniors need convenient, accessible and affordable transportation, both to meet daily needs and to mitigate the risk of isolation and loneliness. © CUTA

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The MWI (shown in Figure 7.1) will enable residents and decision-makers to quickly understand how the region is performing on specific indicators related to the challenge and outcome statements. The MWI will be directly tied to the data collected and analyzed at the SSIIC. Additional MWI tools, including assessment scorecards, will supplement the index to summarize how current the information is and to provide details on the scoring of each metric.

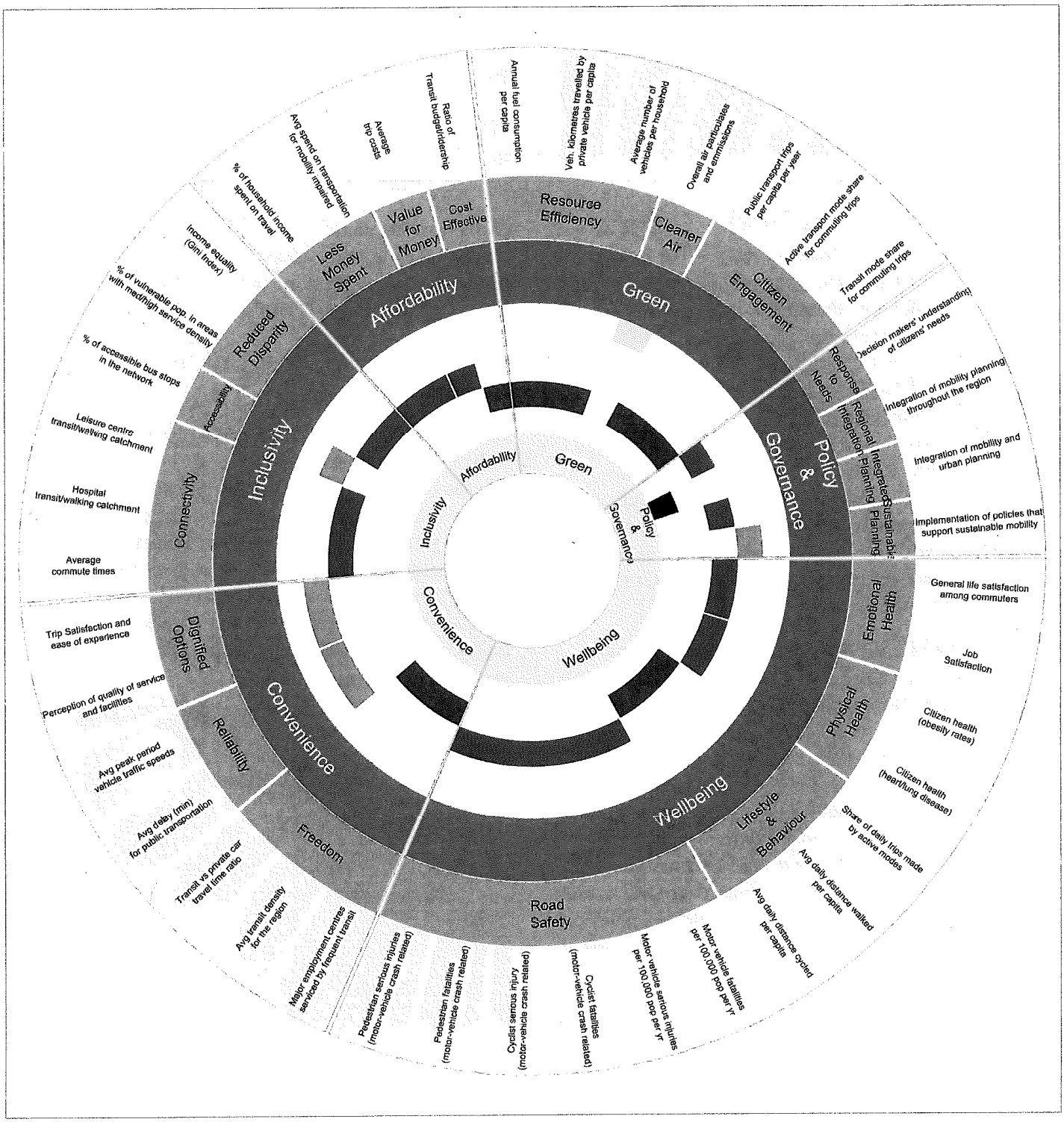


Figure 7.1: Mobility Wellness Index

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7.1.2 LINKING ACTIVITIES, INPUTS AND OUTPUTS

Table 7.1 outlines key activities for all projects aligning with Figure 6.2. For each project, we have defined the activities, inputs and outputs that are delivered as part of the four Stage Gates. The key resources and partnerships necessary for success are listed for each activity as inputs. The table links the activities, inputs, and outputs. Each of these activities are intended to progress us towards our five outcome statements and to a sustainable solution beyond the smart cities grant. In Section 7.1.3, we discuss our monitoring and evaluation plan to measure our progress toward outcomes.

Table 7.1: Project activities, inputs and outputs

Stage Gate	Activities	Inputs	Outputs
Project 1 - Integrated Mobility as a Service (MaaS)'			
1	Select partner and scoping	• Resources: Community and User Engagement, Technology and Development, Data, Security and Privacy	• Detailed co-design strategy and technology development roadmap • Selected MaaS partner
1	Co-design and level 1 MaaS	• Resources: Community and User Engagement, Technology and Development • Key partners: MaaS partner, co-design and delivery partners • Indigenous Smart Mobility Pilot: vehicles, drivers	• Initial MaaS website/application tailored to three co-design target group requirements and integrated with MaaS microservices. • Prototype MaaS service in operation with trial co-design group • Identified potential revenue sources • Feedback from users and partners involved in trial
2	Co-design and level 2 MaaS	• Resources: Community and User Engagement, Technology and Development • Key partners: MaaS partner, co-design and delivery partners • Indigenous Smart Mobility Pilot: vehicles, drivers	• New users and feedback from co-design target groups across Greater Victoria • Revised prototype, tested potential revenue sources, and new functionality based on user feedback
3	Co-design and level 3 MaaS	• Resources: Community and User Engagement, Technology and Development • Key partners: MaaS partner, co-design and delivery partners • Indigenous Smart Mobility Pilot: vehicles, drivers	• New users and feedback from adjacent and new markets across Greater Victoria • Solution developed with established revenue source and new functionality added based on user feedback • Full MaaS solution scaled for use by adjacent and new markets in service
4	Sustainable solution – ongoing improvements and scaling	• Resource: Technology and Development • Key partners: MaaS partner, scaling partners (e.g. BC Transit, CUTA)	• Sustainable MaaS solution with revenue stream in service. With partners, learnings help to scale solutions across Canada and internationally
Project 2 - Smart Trip Planning and Single Payment Platform			
1	Select partner and scoping	• Resource: Technology and Development	• Detailed technology development roadmap • Selected MaaS partner (same as Project 1)
1	Level 1 microservices	• Resource: Technology and Development • Key partner: MaaS partner	• Platform connected to transport operator APIs (via SSIIC) that enables basic trip planning • Identified revenue sources for platform
2	Level 2 microservices	• Resource: Technology and Development • Key partner: MaaS partner	• Platform enables trip planning and booking (using transport operator systems) • Additional functionality as identified by three co-design groups • Tested revenue sources for platform
3	Level 3 microservices	• Resource: Technology and Development • Key partner: MaaS partner	• Platform enables full trip planning, booking and payment using a single account • Additional functionality as identified by adjacent and new markets • Established revenue sources for platform
4	Sustainable solution – ongoing improvements and scaling	• Resource: Technology and Development • Key partners: MaaS partner, CUTA	• Platform with revenue stream scaled for use across Greater Victoria, with lessons learned for Canada

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Table 7.1: Project activities, inputs and outputs (continued)

Stage Gate	Activities	Inputs	Outputs
Project 3 - Smart South Island Inspiration Centre (SSIIC)			
1	Engage Operators and develop data agreements	• Resource: Data, Security and Privacy • Key partners: transport operators, local municipalities	• Data sharing agreements and data licensing agreements with transport operators and open-data providers (e.g. local municipalities)
1	Select Partner + scoping	• Resources: Technology and Development, Data, Security and Privacy	• Specification with SSIIC digital architecture with technical, data, privacy and security requirements • Selected technology development partner
1	Co-design and Level 1 SSIIC	• Resources: Data, Security and Privacy, Technology and Development, Community and User Engagement • Key partners: technology partner, focus groups with data consumers • Data: Stage Gate 1 data requirements	• SSIIC digital platform – regional open data platform connected to transport operator APIs and open-data providers, and website/open data portal with visualization of spatial data layers on a map • Identify potential revenue sources
2	Engage Operators and develop data agreements	• Resource: Data, Security and Privacy • Key Partners: Stage Gate 2 data providers	• Data sharing agreements and data licensing agreements for Stage Gate 2 data.
2	Co-design and Level 2 SSIIC	• Resources: Data, Security and Privacy, Technology and Development, Community and User Engagement • Key partners: technology partner, focus groups with data consumers • Data: Stage Gate 2 Data requirements	• SSIIC Level 2 digital platform – Website/open data portal with visualization and mapping, plus analytics tools that reveal insights related to five outcomes • Tested potential revenue sources
3	Engage Operators and develop data agreements	• Resource: Data, Security and Privacy • Key partners: Stage Gate 3 data providers	• Data sharing agreements and data licensing agreements for Stage Gate 3 data
3	Co-design and Level 3 SSIIC	• Resources: Data, Security and Privacy, Technology and Development, Community and User Engagement • Key partners: technology partner, focus groups with data consumers • Data: Stage Gate 3 Data Requirements	• SSIIC Level 3 digital platform - Website/open data portal with visualization, mapping, and analytics tools, plus functionality to simulate/model impacts on outcomes • Established revenue sources for platform
4	Sustainable solution - ongoing improvements and scaling	• Resource: Data, Security and Privacy, Technology and Development • Key partners: technology partner, data providers • Data: New data sources as required	• Ongoing operation of SSIIC with sustainable revenue source; scaled to broader data sets beyond transportation • Lessons learned and best practices on the infrastructure, data governance, data privacy, and processes on the SSIIC model for data-driven civic engagement
Toolkits and scaling			
2	MWI Toolkit	• Resources: Planning, Monitoring and Evaluation, Data, Security and Privacy, Marketing and Communications • Key partners: partner municipalities (e.g. Montreal)	• Toolkit containing the indicators and methodology to calculate a Mobility Wellness Index in other cities and regions in Canada
2	Co-Design Toolkit	• Resources: Community and User Engagement, Marketing and Communications • Key partners: co-design facilitators	• Co-Design Toolkit with templates, materials, instructions to undertake a co-design process in a community
3	MaaS Guidance	• Resource: Technology and Development, Marketing and Communications • Key partner: MaaS partner	• Lessons learned, best practices, and guidelines on the infrastructure and process required to implement MaaS in a community
4	CUTA Scaling	• Resource: Marketing and Communications • Key partner: CUTA	• Published and shared by CUTA to municipalities and transit agencies across Canada

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7.1.3 MONITORING AND EVALUATION PLAN

Grounded in the MWI, our monitoring and evaluation plan is designed around key performance indicators (KPIs) linked to our five outcome statements. Qualitative sources include self-reporting of trip satisfaction, perception of alternative modes, and subjective wellbeing assessment. Quantitative sources include average commute times, average trip costs, and the population within a travel time catchment of key destinations. As outlined in Chapters 2 and 5, these data sources will be integrated with others through Project 3 (SSIIC), which will provide visualizations and analytics on how both personal and community decisions on transport and mobility advance our outcome statements.

The following tables (Tables 7.2–7.6) outline our preliminary, intermediate and long-term outcomes for each outcome statement. For brevity, we have summarized our detailed logic model in the summary tables below for each outcome statement. The tables also reference the primary and alternate KPIs (associated with the MWI) that we will use to measure our progress towards achieving the challenge statement. The stated outcomes align with the timelines and deliverables within our Stage Gate approach, which is detailed in Chapter 6.

Table 7.2: Convenience outcome and KPIs

Outcome statement 1 (Convenience): With more convenient, accessible multimodal transportation options enabled by smart technology, the share of residents with access to convenient alternatives to single-occupancy vehicles will increase at least 20% by 2024.

Sub-themes: Connected, seamless, well-functioning, multiple options, integrated, faster, efficient, inclusive, accessible
KPIs: Perception of quality of service and facilities (transit, shared and active modes) (primary); average commute times, proportion of population within 400m of a fixed route transit stop
Data Sources (sample): CRD OD Survey; BC Transit Customer Satisfaction Survey; Subjective Wellbeing Assessment Toolkit; BC Transit routes/stops; Statistics Canada (census population)

Outcomes	Target	Monitoring period
Preliminary outcomes	Half of the participants in our co-design target groups with improved access to convenient alternatives to single-occupancy vehicles	Stage Gate 1
Intermediate outcomes	Two-thirds of participants in our co-design target groups with improved access to convenient alternatives to single-occupancy vehicles	Stage Gate 2
Long-term outcomes	Users of MaaS and the Trip Planning and Payment Application with access to convenient alternatives to single occupancy vehicles will increase by at least 20% (compared to baseline)	Stage Gate 3

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Table 7.3: Affordability outcome and KPIs

Outcome Statement 2 (Affordability): With improved multimodal transportation options and trip planning enabled by smart technology, area residents will spend, on average, less than 10% of their household incomes on transportation costs.

Sub-themes: Cost-effective, value for money, resource-efficient, less money spent on travel.
KPIs: Average trip costs (primary); percentage of household income spent on travel; average cost of vehicle ownership
Data Sources (sample): Calculation based on regional fuel costs, transit fares, and distances travelled; Statistics Canada (Household spending – Table: 11-10-022-01); ICBC

Outcomes	Target	Monitoring Period
Preliminary outcomes	Half of the participants in our co-design target groups will spend less on transportation compared to baseline (prior to participation)	Stage Gate 1
Intermediate outcomes	Two-thirds of the participants in our co-design target groups will spend less on transportation compared to baseline (prior to participation)	Stage Gate 2
Long-term outcomes	Users of MaaS and the Trip Planning and Payment Application will spend, on average, less than 10% of their annual household incomes on transportation	Stage Gate 3

Table 7.4: Wellbeing outcome and KPIs

Outcome Statement 3 (Wellbeing): With multimodal transportation options and planning enabled by smart technology, the number of daily trips made by active and healthy travel modes (i.e., walking, transit, cycling) will double by 2024 over the current baseline, and average levels of reported trip satisfaction in the region will rise 10%.

Sub-themes: Safer, healthier, less stressful commute, enjoyable commute, comfortable, improved social connectivity.
KPIs: Share of daily trips made by active modes (primary); trip satisfaction and ease of experience; citizen health; subjective wellbeing assessment
Data Sources (sample): CRD OD Survey; active tracking (smartphone or wearable); BC Ministry of Health; Subjective Wellbeing Survey

Outcomes	Target	Monitoring Period
Preliminary outcomes	Half of participants in our co-design target groups will report an increase in the number of active and healthy trips and an increase in trip satisfaction (from baseline)	Stage Gate 1
Intermediate outcomes	Two-thirds of participants in our co-design target groups will report an increase in the number of active and healthy trips and an increase in trip satisfaction (from baseline)	Stage Gate 2
Long-term outcomes	Users of MaaS and the Trip Planning and Payment Application will double their use of active and healthy travel modes over the current baseline, and average levels of reported trip satisfaction of these users will rise 10% (from baseline)	Stage Gate 3

Table 7.5: Green outcome and KPIs

Outcome Statement 4 (Green): Due to shifts in number of per-capita daily trips taken with personal automobiles towards daily trips per-capita taken with alternative travel modes, per-capita vehicle fuel consumption will decrease by 15% by 2024

Sub-themes: Lower carbon footprint, efficient mobility, MWI
KPIs: Annual fuel consumption per capita (primary); per-capita vehicle kilometres travelled by private vehicle; active transport/transit mode share
Data Sources (sample): Statistics Canada (The Canadian Vehicle Survey); CRD OD Survey; Data BC (GHG emissions measurements)

Outcomes	Target	Monitoring Period
Preliminary outcomes	One-third of participants in our co-design target groups will decrease their fuel consumption by 15%	Stage Gate 1
Intermediate outcomes	Half of participants in our co-design target groups will decrease their fuel consumption by 15%	Stage Gate 2
Long-term outcomes	Half of the users of MaaS and the Trip Planning and Payment Application report their vehicle fuel consumption has dropped by 15% (compared to baseline)	Stage Gate 3

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Table 7.6: Inclusivity outcome and KPIs

Outcome Statement 5 (Inclusivity): As a result of improved and more integrated multimodal transportation options and trip planning enabled by smart technology, 20% more low-income residents and/or marginalized residents will report improved access to their places of education, services and/or employment by 2024.

Sub-themes: Equity, diversity, fairness, participation in society, economic mobility, physical accessibility
KPIs: Population within 15, 30 and 60 minutes of nearest employment centre, education, hospital, or leisure centre by transit/walking (primary); proportion of vulnerable population within areas with medium to high transit density
Data Sources (sample): SIPP calculation based on BC Transit routes/stops data, local municipality location data, and Statistics Canada population data

Outcomes	Target	Monitoring Period
Preliminary outcomes	Half of participants in our co-design target groups will report an increase in access to their places of education, services and/or employment	Stage Gate 1
Intermediate outcomes	Two-thirds of participants in our co-design target groups will report an increase in access to their places of education, services and/or employment (over baseline)	Stage Gate 2
Long-term outcomes	10% more low-income and/or marginalized residents will report improved access to their places of education, services and/or employment (from baseline)	Stage Gate 3

7.1.4 OUTCOMES-BASED CONTRIBUTION AGREEMENT

We propose to align our outcome-based contribution agreement with our combined Agile and Stage Gate approach. As described in Chapter 6, this approach focuses on providing initial services quickly, monitoring progress, and iterating based on lessons learned. In this way, we have planned multiple releases and deliverables within each Stage Gate to progress toward our outcomes.

Table 7.7 gives a high-level summary of our outcome-based contribution agreement. During the implementation phase, we will expand on the Stage Gate elements to develop a more granular feedback, check-in and grant funding calendar. In particular, we propose an advance cash contribution towards Stage Gate 1 that is triggered once we have selected our technological development partners. Within the Appendix, we outline our Financial Plan in which we discuss how we will manage the funding to effectively deliver the project outputs and outcomes.

Table 7.7: Summary of proposed outcomes-based contribution agreement

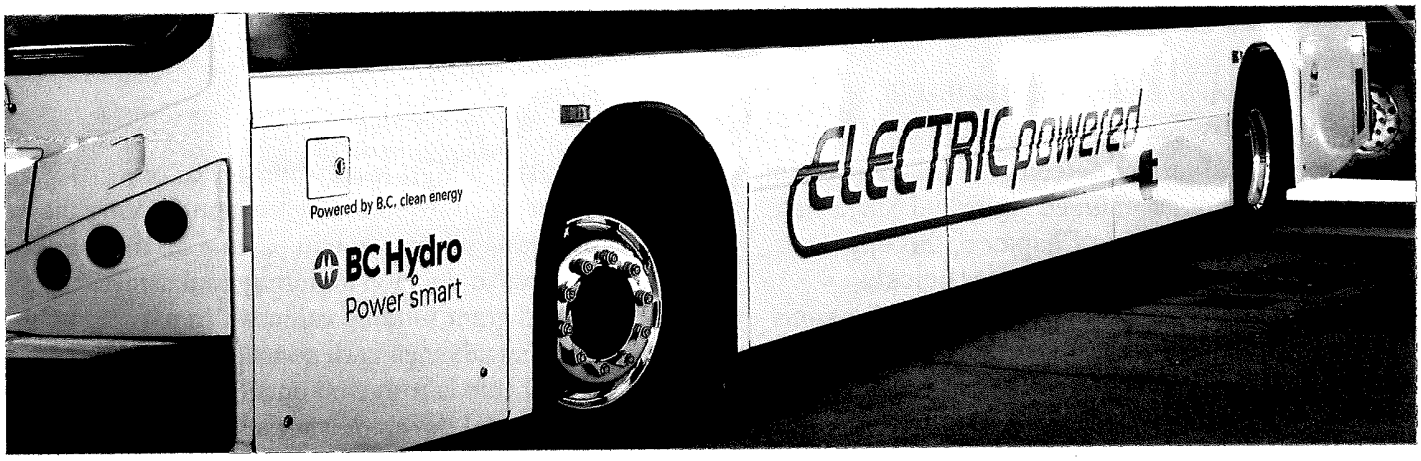
Stage Gate	Amount
Advance Contribution toward Stage Gate 1	$500,000
Stage Gate 1	$3,000,000
Stage Gate 2	$3,000,000
Stage Gate 3	$3,000,000
Final Report	$500,000
Total	$10,000,000

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7.2 RISK MITIGATION

Table 7.8: Risk mitigation strategies

RISK	MITIGATION STRATEGIES
Inability to access third-party data sourced from external databases	We have ensured that our performance indicators can be measured using databases that are routinely updated and surveys that are regularly conducted (including eventually embedded into various user interfaces). We have also ensured that the data points on which we are relying come from reliable sources and surveys, identifying overlap between data sources for cross-referencing. Furthermore, in noting the collection and publication schedules for different data points, we strategically coordinated our performance measurement timelines according to the availability of data.
Changes to data sources used for baseline measurements	
Infrequency or lack of updates to data sources required for monitoring performance	
Data privacy/ownership	The MWI and the SSIIC will adhere to the high standards within the data management plan, described in Chapter 5.
Data are inconclusive on the progress towards outcomes	Through the SSIIC, we will consolidate a wide range of datasets to help derive new insights for an Outcome Statement. Should a high-level metric be inconclusive, we will have access to detailed datasets to undertake further analysis to explore the issue alongside partners and informants.
Data are expensive to collect	We have identified primary and alternate KPIs and data sources and will select the KPI and monitoring frequency that balances the insight and value for money.
Qualitative data may be affected by survey quality and sampling bias	We will confirm the source of the qualitative data and, through the co-design target groups, make sure that the questions are relevant and clear to respondents.



Electric buses contribute to a cleaner transit fleet.

CHAPTER 7 LINKAGES TO OUTCOME THEMES

Convenience
Many KPIs measure average commute times, proportion of population living near transit, and quality of transit service, facilities etc.

Affordability
Many KPIs measure average trip costs, percentage of household income spent on transportation etc.

Wellbeing
Many KPIs measure share of daily trips made by active modes, citizen health, subjective wellbeing assessment etc.

Green
Many KPIs measure annual fuel consumption and vehicle kilometres travelled per capita, mode share using active transport/ public transit etc.

Inclusivity
Many KPIs measure accessibility to jobs, education, healthcare, or leisure centre by transit/ walking, proportion of vulnerable population within areas with medium to high transit density etc.

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CHAPTER 8
Implementation Phase Requirements

8.1 REPORTING AND LEGAL REQUIREMENTS

This chapter outlines how we will be compliant with the relevant local, provincial, and federal regulations and requirements during the implementation phase and outlines the associated risks and mitigation strategies. The implementation phase requirements include a Duty to Consult with Indigenous groups, Modern Treaty Obligations, Community Employment Benefit and Climate Lens Assessment.

8.1.1 DUTY TO CONSULT WITH INDIGENOUS GROUPS

Across the region there are 10 First Nations communities: Tsartlip, Tsawout, Pauquachin, Tseycum, Malahat, Songhees, Esquimalt, T'Sou-ke, Sc'ianew (Beecher Bay), and Pacheedaht First Nations. Seven of these First Nations are active members of SIPP, ensuring we are well positioned to engage and consult with these communities.

The Duty to Consult with Indigenous groups is triggered when a planned action or initiative may result in an impact to a credible territorial claim, a Treaty or Constitutional right. Given that part of Project 1 (MaaS) is intended to serve Indigenous communities, this may trigger a Duty to Consult with Indigenous communities if an impact to a right or title is a possibility.

Beyond Duty to Consult, we know that engagement and building partnerships with Indigenous communities is paramount during all phases so that solutions meets community needs. During the finalist phase, we developed the project rationale and concept in collaboration with representatives from Songhees Nation and Sc'ianew Nation and W̱SÁNEĆ school board. As outlined in Chapter 4, we have learned about the needs of the students in these communities and understand how these communities can be partners in the delivery of the Indigenous Smart Mobility Pilot.

During the implementation phase, we commit to ongoing engagement and collaboration with Indigenous communities across the region. As detailed in Chapter 4, SIPP has a number of First Nation partnerships, and many initiatives have been developed specifically to be inclusive of First Nation communities. Further, as described in this proposal, Indigenous students will co-design our Indigenous Smart Mobility Pilot. Through this co-design process, we will better understand the transportation, mobility and accessibility challenges experienced by First Nations communities. We will continually seek their feedback and input during the technology development process. We will also continue to identify and cultivate partnerships with Indigenous communities related to the delivery of MaaS services.

SIPP leadership takes a collaborative approach and relies on First Nations partners to offer expertise on appropriate approaches and programs addressing First Nations needs. For the SMP, we commit to engaging and consulting with the First Nations communities in line with the guidance issued by the British Columbia Ministry of Indigenous Relations and Reconciliation: *Guide to Involving Proponents When Consulting First Nations*, which outlines the approach to consultation including preparation, engagement, accommodation, and decision and follow-up.

8.1.2 MODERN TREATY OBLIGATIONS

Five of the 10 First Nations in the region are currently negotiating modern treaties with the Crown through the BC Treaty Process. The T'Sou-ke, Sc'ianew, Songhees and Malahat First Nations are negotiating under the Te'Mexw Treaty Association and signed an Agreement-in-Principle in 2015. Negotiating separately with the Crown, Pacheedaht signed a Framework Agreement in 1997 and are aiming to sign an Agreement-in-Principle in 2019.

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At this time, there are no modern treaties implemented between the Crown and the First Nations in the region that will trigger an obligation for this application. However, as our partnering First Nations may reach final agreement in the next five years and become modern treaty Nations, SIPP recognizes the significance of this shift in self-governance.

SIPP is fully committed to supporting our partners as they establish self-governance, and we commit to fulfilling any associated obligations that are relevant to our projects.

8.1.3 COMMUNITY EMPLOYMENT BENEFITS

The Community Employment Benefits (CEB) is a reporting framework for projects that receive funding under the Investing in Canada Infrastructure Program. This reporting framework focuses on employment and/or procurement opportunities provided to at least three of the following groups: apprentices; Indigenous peoples; women; persons with disabilities; veterans; youth; recent immigrants; and small-sized, medium-sized and social enterprises.

SIPP has led considerable engagement with governments, stakeholders and community members to best understand regional transportation challenges. SIPP has identified three groups for employment opportunities, outlined below, based on their current needs and gaps related to transportation and mobility.

Indigenous peoples

We have selected Indigenous peoples not only because they are active members of SIPP, but also because First Nations communities face specific mobility barriers that prevent meaningful access to education and economic opportunities. In the near future many of our First Nations partners will be evolving into modern treaty Nations with self-governing rights. This historic change will create many new opportunities. Project 1 (MaaS) will produce Indigenous-owned employment opportunities through the development of the Indigenous Smart Mobility Pilot (for example, within this ownership structure, jobs such as administrators, coordinators, and drivers will be needed).

Persons with disabilities

Our projects will offer opportunities to hire persons with disabilities, including members of our region's rapidly growing senior population, perhaps as call centre representatives, to encourage peer-to-peer support.

Small-sized, medium-sized and social enterprises

As an economic development organization, our mandate is to advance sustainable and inclusive economic prosperity in the region. We have selected this group as critical to support and monitor, as our SMP can directly and indirectly generate growth in these enterprises. Technology development has direct influence in the selection and partnership of small-sized, medium-sized and social enterprises in the development of the SMP. This could be through a partnership with these enterprises derived from the Open Innovation Challenges. Furthermore, we could indirectly support higher employment through our SMP. As transport and mobility within Greater Victoria is made more convenient and affordable, the region will become a more attractive place for small, medium, and social enterprises to locate their businesses.

During implementation, we will track progress by monitoring and reporting on the number of people employed in these target groups. We will also document the value of contracts awarded to small-sized, medium-sized and social enterprises. We will then consolidate both values for submission in our annual report and financial statements, issued to Infrastructure Canada.



The SMP will create a range of employment opportunities in the region.

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8.1.4 CLIMATE LENS ASSESSMENT

A Climate Lens Assessment is required by Infrastructure Canada for the SCC if, over the three-year program timespan:

- The total eligible project costs are $10M or greater; and
- The project addresses climate change mitigation, adaptation or resilience or disaster mitigation.

While this project meets the first criteria, the core focus of the project is on improving transport and mobility and does not meet the second criteria. Therefore, a Climate Lens Assessment would not be required during our implementation phase.

8.1.5 PASSENGER TRANSPORTATION ACT

Compliance with the *Passenger Transportation Act* is critical for SIPP given its pertinence to the SMP. The *Passenger Transportation Act* in British Columbia requires individuals and companies operating commercial passenger vehicles to have a passenger transport license.

While SIPP is not in the business of operating transportation services, our SMP includes the development of technology to improve transportation convenience for residents. The inclusion of technology as a solution may enable the development of new transportation services or the entry of new transportation operators into the Greater Victoria market.

Therefore, we will ensure the transport operators that partner with SIPP are compliant with the provisions within the *Passenger Transportation Act*, as a condition of the partnership. We will require any personal transport operators exempt from the Act to provide evidence that they have the appropriate license and insurance to operate their vehicle. Furthermore, specific to Project 1 (MaaS), SIPP will cross-reference the *Community Care and Assisted Living Act* to ensure the project is in full alignment with special facilities where specialized mobility services are warranted.

8.2 RISK MITIGATION

Table 8.1: Risk mitigation strategies

RISK	MITIGATION STRATEGIES
Transport operators and providers that wish to send data may not have the appropriate licensing to operate a passenger vehicle in British Columbia.	As part of the Data Sharing Agreement and service agreement negotiations, transport operators and providers must demonstrate that they meet the licensing and insurance requirements as outlined in the *Passenger Transportation Act*.
Progression in BC Treaty negotiations with First Nations may change the obligations that are required during the implementation phase. Delays in consultations interfere with project delivery.	First Nations form part of our governance structure with board level oversight, which strengthens our ability to monitor treaty negotiation progress. We will engage and work closely with First Nations through co-design of the Projects to understand and accommodate the relevant needs of the communities.

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8.3 FREEDOM TO MOVE: FROM VISION TO IMPLEMENTATION

SIPP's "Citizen-Inspired Transformation" for Greater Victoria kicked-off over two years ago with the development of Vision 2040, which directly informed our "freedom to move" Challenge Statement guiding this Smart City Challenge proposal. Our shared vision for a new mobility future is designed by and for our citizens, and offers an innovative blueprint for how our communities, provincially and nationally, can employ smart technology—and smart citizens—to create meaningful impacts to improving mobility in our region.

The vision, planning, approach and partnership engagements that SIPP continues to lead with regional leaders and stakeholders are ambitious and targeted. The progress made to date has required a substantial amount of hard work, dedication and inspiration and has carefully informed our Smart Mobility Program, which reflects the needs and wants of our residents. Our commitment to deliver truly transformative change through our SMP mobility improvements will be evidenced by swift, well-coordinated implementation and delivery, and through our co-design process with users.

Our performance measurement framework is vital to monitoring project operations and outcomes. It embeds a validated learning approach into our overarching Smart Mobility Program to measure the effects that mobility systems can have on the physical, emotional and financial wellbeing of their users, to deliver Canada's first Mobility Wellness Index.

Our governance framework, outlined in this proposal, ensures the SMP maintains its vision, goals and integrity. Our project management model and outcome-based feedback loop will provide the quick wins required to build momentum. This will be a key element to ensuring the design and development effort with respect to features, functionality and technology solutions are not only best in class and but also inclusive of the diverse needs of users. SIPP's policy framework for data privacy and security will be central to maintaining data integrity for the public and for our partners, whilst also providing guidelines to selecting the smart technologies and innovations we employ to deliver transformative change.

We are prepared. We are excited. We are ready to win. Together, with our citizens, our leaders and our partners, we will advance this shared vision for a smart mobility future into our near-term reality where everyone in Greater Victoria has the "freedom to move."

CHAPTER 8 LINKAGES TO OUTCOME THEMES



Convenience

Transport and mobility within Greater Victoria becomes more convenient

SMP includes the development of technology to improve convenience of transportation



Affordability

As transport and mobility within Greater Victoria is made more affordable, the region will become a more attractive place for small-sized, medium-sized and social enterprises to locate their businesses



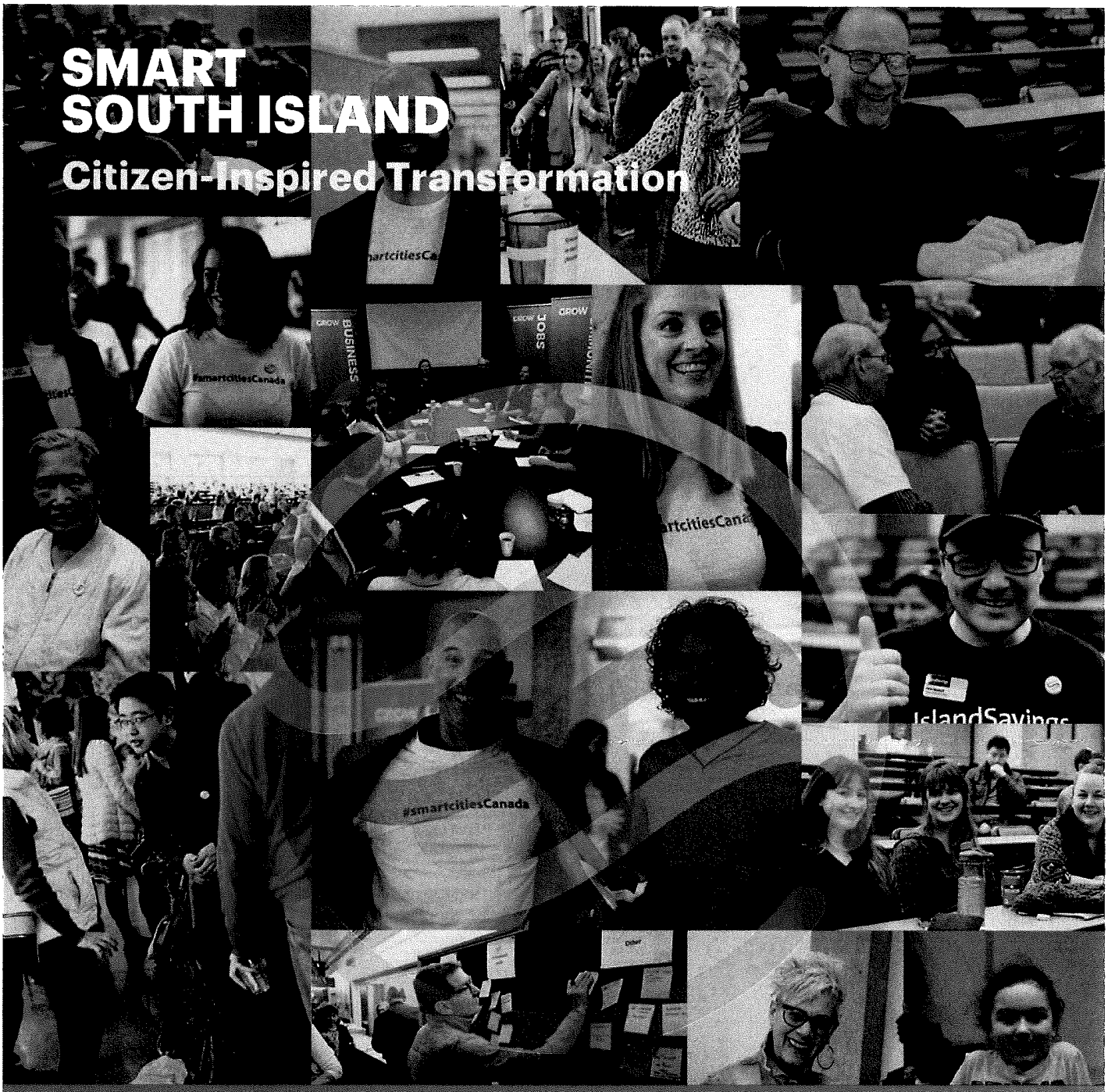
Inclusivity

SIPP engaged 10 First Nations communities

CEB for Indigenous people and persons with disabilities

Partnership of small-sized, medium-sized and social enterprises will ensure the mandate of providing sustainable and inclusive economic prosperity in the region

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It would be impossible to list the countless individuals who made this proposal what it is, but we are deeply grateful for their contributions, particularly our members and their representatives. We would like to take this opportunity acknowledge the leadership and hard work over the past two years of the Steering Committee: Emilie de Rosenroll (Chair, CEO, SIPP), Lisa Helps (Mayor of Victoria), Erinn Pinkerton (CEO, BC Transit), Sean Midwood (SIPP Board Member), Christina Clarke (Executive Director, Songhees Nation) and Ken Armour (Councillor, Esquimalt), as well as the Partners Committee: Lisa Helps (Chair, Mayor of Victoria), Fred Haynes (Vice-Chair, Mayor of Saanich), Kevin Murdoch (Mayor of Oak Bay), Ken Armour (Councillor, Esquimalt), David Screech (Mayor of View Royal), Rob Martin (Mayor of Colwood), Cliff McNeil-Smith (Mayor of Sidney), Celia Stock (Councillor, North Saanich), Bob Thompson (Councillor, Central Saanich), Ken Williams (Mayor of Highlands), Maureen Sawa (CEO, Greater Victoria Public Library), Christina Clarke (Executive Director, Songhees Nation, Sean Midwood (SIPP Board Member) and Rob Janus (Director of Communications, Victoria Foundation).

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I believe in Smart Mobility

I believe in
affordable, easy and convenient transit.

I believe in
putting Greater Victoria at the leading edge of transportation.

I believe
a shorter commute means more time doing what I love.

I believe in
transportation options for the entire region.

I believe in
bringing people, communities, and municipalities together.

I believe in
creating a better world for future generations.

I believe that
new technologies that will simplify our lives.

I believe in
ushering in a new era of transportation.

I believe in
the #FreedomToMove.

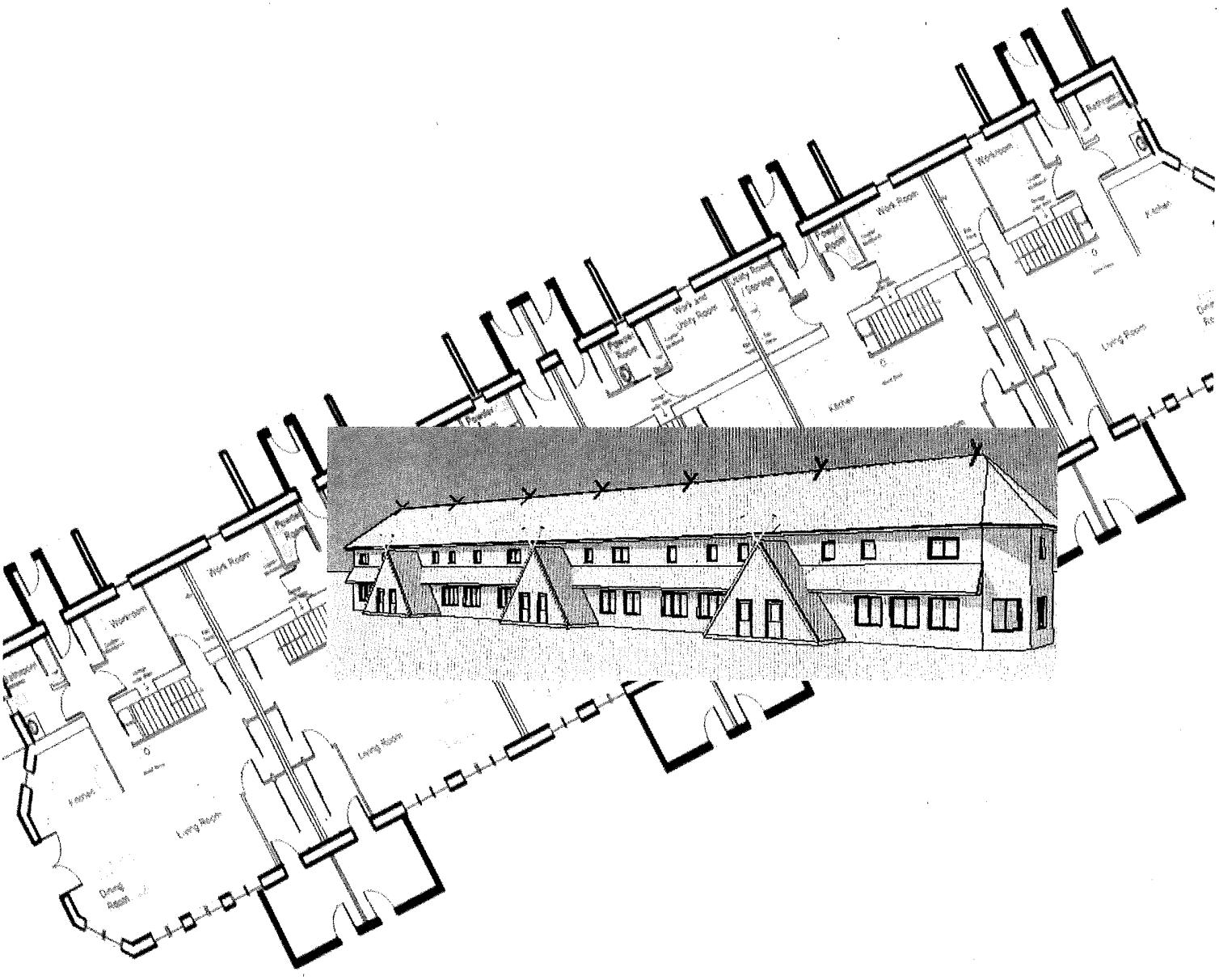
Help Greater Victoria win $10 million for transportation innovation in Canada's Smart Cities Challenge.

Sign the manifesto by March 1st at
SmartSouthIsland.ca

SMART SOUTH ISLAND
Citizen-Inspired Transformation

An initiative by SOUTH ISLAND PROSPERITY PARTNERSHIP

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THE SMART CITIES CHALLENGE

THE CREE NATION OF EASTMAIN'S

NET ZERO ENERGY HOUSING PROGRAM

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EXECUTIVE SUMMARY

Improving Community well-being. This statement highlights the challenge that the CNE intends to overcome with its Net-Zero Energy Housing Program.

Housing is essential for a healthy community and, like many Indigenous communities, the CNE has a critical shortage of housing for its members. The lack of adequate housing in Indigenous communities results in overcrowding, a factor in many of the health and social issues inflicting our communities.

In fact, the quality of housing in Indigenous communities has been a hot topic in Canadian news for years, and even recently. The effects of mould and inadequate housing are being linked in the media to serious health conditions and even the deaths of Elders and children. It is clear that housing remains forefront and centre for Canadians, and especially for Indigenous communities.

Through its Net-Zero Energy (NZE) Housing Program, the CNE will construct quality, energy-efficient homes that are affordable for its members. The NZE Housing Program consists of new builds and retrofitting of existing homes. An inventory of single-family homes, an Accessible House and Multi-Client Six-Plexes (Six-Plex) will ensure that housing responds to members' needs and financial capacity.

The CNE vision is clear – create an affordable, resilient, energy-efficient housing program that offers rental and private homeownership opportunities. Substantial performance measurement activities will enable the CNE to determine the success of its NZE program and ensure that milestones and deliverables are on time and on budget.

By establishing an experienced and dedicated project management team, the CNE has been able to develop a comprehensive project implementation plan aimed at achieving success. The CNE will introduce smart technologies and net-zero building techniques to collect quantitative data on the net-zero performance of the houses built and retrofitted under its NZE program. In addition, the CNE will collect qualitative data on residents' housing experiences.

By having a strong, well-established governance system auditable to an ISO/IMS, the CNE will effectively manage program implementation to ensure outcomes are achieved through effective stakeholder engagement, strong leadership and risk-based thinking. The CNE governance framework is grounded in openness, transparency and accountability.

Throughout the development of its NZE program, the CNE has continuously engaged with stakeholders to lead to better decisions and ensure a holistic approach is taken in addressing the housing crisis in Eastmain.

Because of the nature of the NZE program, the CNE will ensure that personal information collected from its members is used, stored and disclosed in accordance with the Personal

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Information Protection and Electronic Data Act. Information collected under the NZE program monitoring and research activities will be anonymized prior to any disclosure.

The CNE undertook extensive costing exercises that has already yielded savings for our NZE program. The project management team aggressively sought funding, and will continue to do so, in order to supplement the SCC prize money to ensure the viability of the NZE program with minimum financial risk. The CNE has committed to matching the prize money if selected as the $5M category winner.

The aforementioned elements are aimed at bringing success and sustainability to the NZE program. Through collaborations with academia, industry experts and government agencies, the CNE is capable of offering not just housing to its members, but a better quality of life. Initiatives like training, work experience and economic development opportunities will ensure a strong and viable future for the community.

Our NZE program was designed around scalability, transferability and replicability. The smart technologies used are commercially available, the governance structure is easily transferable to other Indigenous communities and the house designs and building techniques can be scaled to reflect the financial and technical capacity of other communities, taking into consideration their culture and traditions.

The CNE is an Indigenous community and therefore benefits from obligations generally on the federal Crown and provinces with respect to the duty to consult and modern treaty obligations. At the same time, the CNE has ensured that its NZE program is inclusive and leads to a better quality of life for youth, women, elders and people with disabilities.

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CHAPTER 1: VISION

The CNE Vision

The CNE is proud of its heritage. Its vision is that of a self-sufficient First Nation that is able to offer its members, and future generations, a better place to live and grow. This vision is confirmed in the CNE 2018-2021 strategic plan (See Annex A).

Our final proposal pursues the vision of improving the quality of life and well-being of our members and our community by establishing a Net-Zero Energy (NZE) Housing Program to respond to the critical housing shortage. Housing is inarguably the foundation of a strong, healthy community. The lack of adequate housing in Eastmain, and other Indigenous communities, is a significant factor in many of the health and social issues inflicting our communities.

Housing issues are rooted in the history of our communities. The Cree Nation of Eastmain's vision is therefore tied to its past.

Eastmain has evolved from its origins as the Hudson Bay trading post headquarters for the east coast of James Bay. In the early 18th century, the Cree people began to settle in the area and the community of Eastmain was established. In 1762, Eastmain was relocated to the south shore of the Eastmain River at the mouth of James Bay to make it more accessible. Notwithstanding the Crees' long occupation of the region and the community, it was only in 1962 that the Lands and Forests Act (RSQ c T-9) reserved the lands for the exclusive use of the Crees of Eastmain.

In the 1960s and 70s, the Crees of James Bay (Eeyou Istchee) joined forces to oppose Quebec's James Bay Hydroelectric Project. From this concerted effort came the first modern day treaty, the James Bay and Northern Quebec Agreement. Since then, the Crees of Eeyou Istchee have entered into a number of other treaties with Canada, Quebec and Hydro Quebec. Most recently, the Agreement on Cree Nation Governance Between the Crees of Eeyou Istchee and the Government of Canada which gives the Cree significant powers of self-government.

Today, Eastmain has a population of approximately 850 people and is the headquarters of the Cree Regional Trappers Association. Much of the economy is based on local and regional government employment, but there are businesses operating in accommodation and food services, retail trade and construction.

Eastmain is therefore a thriving community with strong ties to its traditions.

Initially, like many Indigenous communities, the CNE housing program offered only social housing constructed with federal funding. Housing under this program must be modest and low-cost. However, the housing designs do not satisfy the cultural and social needs of the occupants and the construction techniques relied upon are often not well-suited to northern climates. Consequently, frequent maintenance is needed to ensure the housing units functionality at a cost that undermines their initial affordability.

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The social housing model is no longer sustainable and does not allow the CNE to satisfy the ever-growing demand for housing. This model further fails to reflect the economic realities of Eastmain and other Indigenous communities where successful business endeavours, government employment and traditional lifestyles co-exist, creating different levels of financial capacity.

In an effort to move away from this model and find new solutions to the housing shortage, CNE is changing its housing program. By offering other solutions, such as private homeownership and rent-to-own, the CNE can ensure that social housing is allocated to those who have limited financial capacity. The success of these alternatives to social housing depend upon the CNE overcoming the challenge of creating affordable and sustainable housing options.

Consequently, the CNE developed the Net-Zero Energy (NZE) Housing Program. This program addressed the challenge of building affordable housing that is also affordable to operate. Cree Nation of Eastmain's NZE program aims to offer culturally-appropriate designs, significant reductions in operating costs and enhanced resilience and durability while building community capacity and creating new local employment and economic development opportunities.

Since first conceived, the CNENZE program has seen some changes as a result of our ongoing efforts to design a program that is responsive to the CNE housing needs while reflecting our capacity. As a result, the projects in year 1 will be carried out as pilot projects and will be limited to the construction of an Accessible House and the retrofit of an existing house. This variation was driven by (a) restrictions on bulk buying construction materials before storage is available, (b) the start date for local assembly of building components, and (c) to allow for a true inventorying and costing of construction materials required for the NZE program.

It is noteworthy that the NZE program not only responds to regional directives, it also supports the Government of Canada initiative to develop a "net-zero energy ready" building standard and a model code guiding energy efficiency improvements during renovations. Government of Canada intends to have these codes adopted by the provinces and territories by 2030[1]. The Cree Nation of Eastmain's NZE program will put it at the forefront of this initiative, making it an Indigenous leader in addressing the challenges of environmental sustainability and climate change.

Outcomes

Although housing is but one issue facing Indigenous communities like Eastmain, it is a common underlying factor of many of the social and health issues. Housing that is durable, appealing and comfortable is the foundation of a strong and healthy community which is the Cree Nation of Eastmain's long-term goal. Therefore, the outcome is to establish an inventory of energy-efficient, resilient housing to respond to the needs of its members and

[1] See: https://www.canada.ca/en/services/environment/weather/climatechange/climate-action/federal-actions-clean-growth-economy/homes-buildings.html

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residents. The houses must be comfortable, reflective of the Cree lifestyle and able to withstand the northern climate.

Over the next 6 years, the first being a pilot year, the CNE plans to build 5 new single-family homes, 5 Six-Plexes and retrofit 25 existing homes. This initial inventory will offer private homeownership, rent-to-own and rental options, making housing accessible to everyone.

The NZE program is designed to encourage capacity building and a sense of community. By fostering a sense of pride in the community and Cree culture, our NZE program will become a model for Indigenous communities across Canada.

Reflects CNE's needs

The NZE program is reflective of the true needs of the CNE and its residents. The housing shortage facing Indigenous communities is undeniable and cannot be ignored.

Numerous studies have drawn attention to the enormity of housing issues in the North including the inadequate supply, poor quality construction, poor affordability and designs that address neither the rigorous climate of Canada's north nor the cultural realities of its Indigenous peoples. As noted by Andy Moorhouse, past President of the Kativik Municipal Housing Bureau, when speaking about the reality of remote northern Indigenous communities in a 2011 address, "Housing is not the only issue, but all issues relate to housing"[2].

In its report on "On-Reserve Housing and Infrastructure: Recommendations for Change", the Senate Committee on Housing highlighted "the need to examine current initiatives to addressing housing on reserve". Citing one example of the challenges, the committee noted that even though $300 million had been set aside by the federal government in 2008 for the First Nations Market Housing Fund, which was expected to result in 25,000 new home builds in 10 years, by May 2015 only 99 homes had been built. The Senate noted that new approaches to housing, including innovative designs, alternative programs and new methods of implementation are needed. Northern research has also identified that Euro-Canadian forms of housing are incompatible with the social structure of Indigenous families[3].

CNE's NZE housing program is relevant and responsive to the needs of Eastmain. As of February 2019, the CNE had a shortfall of over fifty housing units, with the demand for two-bedroom units accounting for more than 50% of the current needs.

Inuit studies equivalence - Northern application?

[2] If Not Now, When: Addressing the On-going Inuit Housing Crisis in Canada.
[3] *Examining the impact of Euro-Canadian architecture on Inuit families living in Arctic Canada*, Dr. Peter Dawson, University of Calgary, 2003

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Table 1 – CNE Housing Needs: Past and Future

		Past 5 Years					
		2019	2018	2017	2016	2015	
Backlog per year		52	51	40	36	28	
		Projection over 6-year period*					
	Current	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Housing Stock	255	256	263	270	277	284	290
New NZE Construction		1	7	7	7	7	6
Will reduce backlog to		51	44	37	30	23	17

*Note: It is expected that the housing needs will grow over the next few years as our younger generation ages.

As early as 2000, the Cree Naskapi Commission has emphasized the need to resolve the housing shortage and substandard housing in the Cree communities. Eastmain's NZE program is also in line with Government of Canada's national housing strategy which recognizes the housing crisis facing Indigenous communities and the need to develop new approaches that include increasing private homeownership opportunities, as well as the need to significantly improve the sustainability of housing in Indigenous communities.

Since 2017, the CNE has undertaken significant community engagement to ensure that its NZE housing program is meaningful for its members. In June 2017, the CNE held workshops, conducted home visits and consulted with members with a view to collecting information on house designs of different housing types. At the September 2017 annual general assembly, the CNE engaged in a broader discussion with its members for ideas on how to improve housing. These discussions have been complemented by consultations with service providers including health care and the fire department to ensure a comprehensive approach to addressing the housing shortage and ensuring a solution that is culturally-appropriate and reflective of the Cree way of life.

In addition, the CNE held its first Housing Forum in February 2018. The Housing Forum allowed CNE members to voice their views on the CNE housing needs and the Smart City Challenge proposal. The members contributed to the design of a culturally appropriate NZE multi-unit model home. The information and ideas obtained at the workshops, home visits and annual general assemblies led to the "Cree Café" where smaller focus groups have explored the issues and ideas generated during the broader consultative process. Through its Cree Cafés, the CNE has developed design innovations and established a means for ongoing community consultation on the NZE program.

In addition to high construction costs, the high cost of operation and maintenance remains a significant deterrent to home ownership and the development of home ownership programs in First Nations communities, including Eastmain. New home owners are often challenged to keep up with the high operating costs of their homes, while current social housing programs significantly subsidize operating costs. This deters potential buyers from investing into home ownership, remaining siloed into lifelong housing rental.

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power outages with risk of freezing

Adding to the ever-present concerns around housing shortages and affordability are the issues of energy efficiency, energy security and community resilience. Remote communities like Eastmain are subject to periodic power blackouts that can extend for days at a time. During power outages in Eastmain, most houses which were built to meet the "minimum" requirements of the building code, will freeze up within hours. Moreover, these same houses use considerably more energy than houses in southern Canadian cities, adding to the high cost of home operation while also contributing to climate change.

The Eastmain Cree are attached to their culture and regularly practice traditional activities. In fact, most families rely on hunting, fishing and trapping to supplement their diet. While in the bush practicing their traditional activities, the homes are unsupervised, making them vulnerable to the outcomes of power outages. The construction techniques and smart technologies proposed in the NZE program will significantly reduce these vulnerabilities.

Ambitious and Achievable

The proposal is not only ambitious, but it is realistically achievable. Less than 50 years ago, the CNE had no road access and very little infrastructure supporting its community. Today, Eastmain is a thriving community with an airport, arena, sports complex, schools, health clinic and stores. The CNE provides all the usual municipal services to its members.

The CNE currently has a need for 52 housing units that it cannot satisfy. In a community of 255 homes this is significant. The CNE plans to build 35 new housing units and retrofit 25 homes and buildings over the next six years. This amounts to improving the backlog by 67%. The scale of the proposed program is enormous considering the size and population of Eastmain.

The NZE program is ambitious in that it proposes to tackle a problem that is not simply local but extends to Indigenous communities across Canada. Housing is conceivably the biggest issue facing Indigenous communities which must deal with significant housing shortages and unsuitable construction materials and techniques.

In order to address the significant housing backlog, the CNE plans to implement its NZE housing program. The NZE program is designed to be sustainable because creating an affordable housing scheme doesn't only mean controlling the costs of construction, but also controlling the costs of operating and maintaining homes.

The Cree's connection to family and land are factors that must be at the forefront of any solution if the CNE initiative is to be successful and sustainable. By building new multi-family and single-family homes, and retrofit existing homes, the CNE will be able to offer its residents better quality housing options that respond to their needs and financial capacity.

The CNE has the structure and capacity to implement and achieve success of its NZE program. It has an economic development corporation, Wabannutao Eeyou Development Corporation, and a construction company, Stajune Construction Inc., that are often involved in local community construction projects. The CNE will use both companies with

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a view to maximize local employment, entrepreneurship and housing affordability. It should be noted that Wabannutao Eeyou Development Corporation and Stajune Construction are in the process of restructuring to improve efficiencies for the implementation of our NZE program.

The CNE recognizes that the scope of its NZE program is such that it will need partners who can support and complement its efforts. The CNE carried out considerable consultation with community members and with experts in the areas pertaining to residential construction, construction standards and techniques and net-zero energy technologies.

The CNE identified potential partners because it recognizes that a program this ambitious cannot be undertaken alone. The CNE has established relationships with academia, businesses and government agencies and organizations to ensure the success of its NZE program. Where appropriate, the CNE has secured commitments from its partners and is developing formal agreements relating to the role that these partners will play in the program. These partners will all contribute to ensuring and measuring the success of the program.

In addition, the CNE has engaged with the supply chain. By sharing key information with suppliers, the CNE has been able to start tracking the actual costs of the NZE program. This is just the start of the Cree Nation of Eastmain's efforts to establish a resource management system aimed at enhancing accountability and responsibility.

The CNE has put significant effort and considered all its options to resolve the housing shortage and create better-built, energy-efficient homes. Creating an NZE community is therefore very ambitious but achievable.

Meaningful

The CNENZE program will realize outcomes that are meaningful for residents of Eastmain by constructing new NZE homes and retrofitting existing homes. The new homes will allow CNE members to enter the housing market at different economic levels while ensuring that members who rely on social housing are provided homes that can withstand the northern climate while offering a comfortable living environment.

CNE members have had a say in the NZE program though community consultation sessions and workshops at which they received information about NZE program and smart technologies. More importantly, our members played an important role in shaping the housing designs and the technologies that will be used in the NZE program, ensuring community-wide acceptance and approval.

The lack of adequate housing in Indigenous communities has resulted in overcrowding which is an important factor in many of the health and social issues affecting these communities. The current housing model and funding formulas in the on-reserve social housing program are not a sustainable solution to the housing shortage. These have resulted in the widespread use of housing designs that do not meet the cultural and social

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needs of occupants and construction techniques and standards that are often not well-suited to northern climates.

Well-suited to Smart Cities Approach

The CNE NZE program is grounded in the past and forward-looking in proposing an achievable solution to the longstanding housing shortage, making it well suited to the Smart Cities approach. The CNE has a community wide fiber optic infrastructure, making it ideal for a Smart Cities approach to creating a connected, energy-efficient community.

[redacted]

Significant collaboration with experts, suppliers and key stakeholders has enabled the CNE to design its NZE program. Academic partners have jumped on board to undertake studies of measurable outcomes like energy savings and generation and less tangible outcomes like the comfort and happiness of occupants of NZE homes. Suppliers and government agencies consider the NZE program proposed by the CNE as creating new opportunities for development and capacity-building in the North.

The NZE program embodies the Smart Cities approach by employing smart technologies and connectivity to ensure open, transparent, accountable and responsible government. CNE is implementing a combination of ISO Standards to put in place processes and standards to better serve its members and increase transparency and accountability. These efforts include creating policies and First Nation laws that establish guidelines, a framework and rules in discrete areas, including housing. Given the importance of housing to community well-being, evolving societal views and the ever-changing technical landscape in this sector, the CNE intends to continue the revision of its Housing Policy, a process started at its Housing Forum, where members were given an opportunity to voice concerns and put forward ideas to improve community housing.

The smart technologies to be used in establishing NZE homes will ensure that traditional practices are supported in modern homes. Occupants or the CNE can monitor homes even while in the bush to ensure that the home systems are properly functioning.

The data generated through smart technologies will allow for better decision-making by the CNE and empower residents to better control energy use. This data will also enable the CNE to adjust its NZE program to be more responsive to the needs of its members. More importantly, such data may facilitate discussions with public energy agencies on energy use and with Canada Mortgage and Housing Corporation on housing designs and construction materials for northern climates.

The CNENZE program is transferrable to other communities facing housing issues and looking to create a more sustainable, resilient housing program. Not only can the NZE program be shared with other communities, it can be scaled to reflect the needs and capacities of these communities. Furthermore, our NZE program is particularly responsive even for off-grid communities as it will decrease the energy load on the diesel-generated electricity grids, thereby reducing significantly greenhouse gas emissions.

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Measurable

The smart technologies to be used in the construction and retrofitting of homes will permit detailed data collection relating to energy use and production. The CNE will leverage this data to make better decisions and ensure the NZE program attains its objectives. The data will also be used by the CNE and its partners to make improvements to the NZE program and measure its success.

In addition to monitoring the NZE program, a social research platform will be established to assess, over time, how the program is contributing to community well-being. Housing conditions are a well-recognized determinant of health. We will evaluate how the NZE program fosters a sense of well-being by (a) reducing overcrowding through the construction of new homes, (b) improving comfort and livability by retrofitting existing homes, (c) designing houses that meet the cultural and social needs of occupants, and (d) by offering a range of housing tenure.

This social research platform will also serve to document the opportunities, challenges and best practices for scaling the NZE housing program to other Indigenous communities across the country.

Progress toward Outcomes

Since first submitting its proposal, the CNE has continued in its efforts to implement its NZE program.

The CNE has conducted community consultations and obtained community support for the NZE program. With input from members, the CNE has developed housing models that reflect and complement Cree culture in their layout and design.

The CNE has conducted modelling exercises to ensure that the NZE homes can achieve net-zero energy status. Through this process, the CNE has identified the building system, levels of insulation, the types of windows, the size of solar energy component and the other technical requirements needed to achieve net-zero energy in Eastmain.

Finally, the CNE has obtained funding from Canada Mortgage and Housing Corporation to develop and implement the social research platform in collaboration with the Canada Research Chair in Housing, Community and Health at McGill University in Montreal.

Why Choose Us

The CNENZE program is concrete, measurable and transferable. This means that it aligns perfectly with Canada's declaration that housing in Indigenous communities is a government priority.

While NZE projects may not be considered innovative generally, establishing an NZE program in the North is innovative. Moreover, implementing a community-wide NZE program that includes multi-unit residential buildings has never been contemplated – until now. Implementing the NZE program as an opportunity for capacity-building also sets the CNENZE program apart and makes it innovative.

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The CNE approach to the Indigenous community housing crisis makes our NZE program super-innovative. The CNE is addressing this holistically by bringing together community members, private sector actors, experts, public sector agencies and academia in order to find feasible solutions to creating affordable and resilient housing.

Much interest has been expressed in the CNE NZE program because it is aimed at a diverse clientele. Under our NZE program, the CNE is offering rental housing for low-income residents, rent-to-own and entry-level private homeownership. The designs give the CNE the flexibility of blending clientele for any combination in the Six-Plex and other housing options.

Unlike some proposals, the CNENZE program is relevant and responsive to the situation in many Indigenous communities across Canada. Creating an affordable, resilient housing program therefore also addresses a national problem, the critical housing shortage in Indigenous communities. The collection and analysis of pertinent data will allow the program to adapt accordingly to real quantifiable and qualifiable needs.

Our NZE program can be scaled to reflect the needs, financial constraints and capacities of other Indigenous communities across Canada. The program's scalability makes it easily transferable to other Indigenous and non-Indigenous communities as a solution to address housing shortages. Moreover, the program is designed to create economic development and capacity-building opportunities for Indigenous communities.

By designing a program that adheres to Smart City principles the CNE is setting the groundwork for a future of sustainable and durable housing for Indigenous communities that ensures openness, transparency and accountability at all levels. This means that members of these communities are involved in resolving the issues affecting their housing programs and informed of contracting and expenditures related to NZE homes.

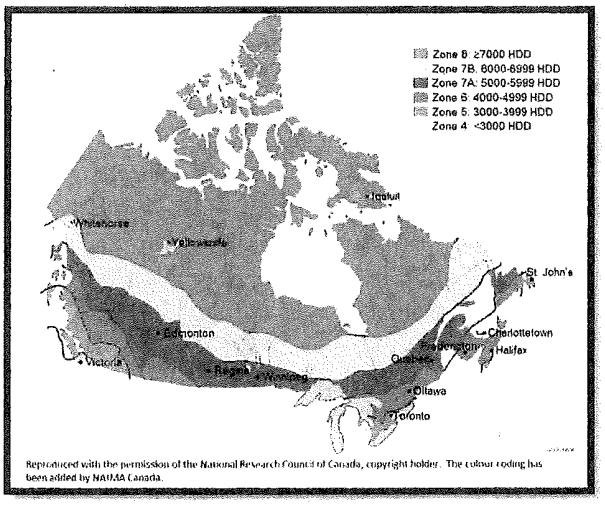
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CHAPTER 2: PERFORMANCE MEASUREMENT

Outcomes-based Performance Measurement Plan

Eastmain is located in Climate Zone 8 (Figure 1), the coldest climate zone in Canada.

Figure 1. Climate Zone Map



Its location and climate bring challenges to the CNE goal of creating a net-zero energy community. The collection and analysis of performance data relating to the NZE program is essential. Significant technical, social and costing data will be collected during the project. Technical data will be used to measure the performance of the homes constructed and retrofitted under the NZE program and will enable the CNE to identify shortcomings and take lessons-learned to make adjustments to the building systems and equipment accordingly. Social data will be used to measure the success and suitability of the designs selected for the NZE program and to make changes as may be needed to ensure the comfort and enjoyment of the occupants. Costing data will be used to first determine the actual itemized costs of construction and to build on efforts to reduce the cost of housing construction in Eastmain.

To address the wide range of housing issues in Eastmain, as part of the Smart Cities Challenge, the CNE will continue its transition from a social housing-based program to a market-based program. The primary criteria for determining housing types for construction will be financial capacity. This will also involve changing the underlying culture in Eastmain where social housing has been deeply inculcated.

The Eastmain NZE housing program is aimed at responding to the need for housing while inciting a shift in culture.

Links to Outcomes

The program will have three primary components: (a) the design and construction of a culturally-appropriate net-zero energy Six-Plexes, (b) the design and construction of a net-zero energy single-family homes, and (c) the net-zero energy retrofitting of existing homes in the community, all of which will be equipped with smart home technologies. These three components will constitute the "next generation" housing in Eastmain and will enhance social inclusiveness, by stimulating our local economy and safeguarding the health and environment of our community.

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Educating residents on the proper use and maintenance of housing will be a longer-term outcome of the CNE NZE program. Likewise, given the new housing policies and rules being implemented in Eeyou Istchee, the CNE must also find ways to inform suppliers and builders that wish to participate in residential construction in Eastmain of these policies and rules.

At the end of the NZE program, the CNE will have created a framework for the design, construction and operation of affordable, durable, comfortable and resilient net-zero energy houses in Northern communities.

Project Activities

Consultation

The CNE has carried out ongoing consultations on housing issues in the community through a range of initiatives including the Eastmain Annual General Assemblies, Cree Café's, design charrettes (integrated design workshops), site visits, meetings, the Eastmain Housing Forum and the Eastmain Builders Forum.

The first step to creating the NZE housing program involved engaging the community in the design of a culturally-appropriate NZE Six-Plex, consisting of 2 social housing units, 2 rent-to-own units, and 2 starter home ownership units. The CNE then consulted members on the design of an NZE single-family home prototype as a model for residents wishing to purchase their own home.

Through further consultation, that included the health and public safety sectors, the CNE designed other NZE housing prototypes to accommodate different needs, including a "Cree Elders House", an "Accessible House" and a starter house. Consultation with the health and public safety sectors also allowed the CNE to ensure that the designs and components of the Six-Plex, single-family homes and Accessible Houses provided a healthy, comfortable living environment that would also respond to the needs of the occupants.

The CNE also engaged with experienced net-energy zero builders who have worked on projects in northern communities. These builders, with other net-energy zero experts, brought a perspective and experience that enabled the CNE to establish the best building strategies, techniques and materials.

The amplitude of the CNENZE program and the goal of creating affordable housing called for engagement with local builders by the CNE and the Cree Nation Government. Local builders were given information on the NZE building concepts and program structures. More importantly, by engaging with the local builders, the CNE obtained their feedback on the proposed building systems and ensured that the building systems and technologies are feasible in Eastmain. This process has set a strong foundation for the integration of the NZE program, thereby ensuring its success in Eastmain.

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Analysis

Much analysis and consideration went into defining the parameters of the CNENZE housing program to ensure that it was feasible and responsive to the realities of the North.

McGill University presented at the Eeyou Mitchuap forum on its Nunavik housing study. This study provides baseline information that has been useful in the preliminary analysis of housing requirements and models and will continue to be useful in testing the results of the CNENZE program.

The CNE consulted different experts on net-zero energy building systems, materials, technologies and construction strategies. Through extensive energy modelling on the Six-Plex and Accessible House the CNE was able to determine the level of energy production that would make net-zero energy feasible in Eastmain. The CNE has calculated the amount of energy production required, including the size of solar array and the capacity of air source heat pumps needed to attain net-zero energy. The CNE has thus determined, in its climate, the combination of energy saving construction techniques and materials (wall systems, insulation levels, windows, etc.) with energy producing technologies (solar photovoltaics, air source heat pump) to successfully achieve net-zero energy.

Analysis will include the activities conducted after implementation of the NZE program. The CNENZE program will include establishing a detailed costing regime that will ensure Smart Cites Challenge funds are used to deliver affordable net-zero energy houses and retrofits with smart technologies within the community. The costing regime will include an in-depth analysis of the transportation costs incurred to bring construction materials to Eastmain. This analysis will enable the CNE to determine the impact of transportation on the overall cost of housing in northern, remote communities like Eastmain.

Pre-NZE Activities

The CNE carried out an assessment of its existing housing inventory to determine the amount and type of renovations required to improve the functionality of these homes. This assessment will permit the CNE to identify the houses that will be best suited for retrofitting to make them function at the net-energy zero level.

Following significant community consultation which enabled the CNE to identify the floor plans and designs, it was time to decide on construction timelines. In order to ensure the program's success, the CNE has chosen to start with a single-family home that will allow it to test its processes and construction techniques. This choice was also driven by the necessity for an Accessible House in the community to respond to the needs of a disabled member. The CNE conducted extensive energy modelling on the Accessible House to ensure that it could satisfy the net-energy zero performance standards.

NZE Program Activities

In 2019, the CNE will construct one single-family Accessible House and carry out one retrofit of an existing home as part of a pilot project. This will also serve as a prototype for Eastmain residents with disabilities. The CNE will have the opportunity to test the construction materials and the building system used in projects before proceeding with the construction of additional single-family homes, multi-unit housing and retrofits.

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These initial construction projects will be used to develop a detailed and comprehensive list of all the materials required for each of the net-zero energy housing projects – the Six-Plex, single-family home and net-zero retrofit. The CNE will also create a detailed breakdown of projected labor costs for each stage of the construction process. Proper tracking and recording of the materials and labour required for each project will ensure that the NZE program is sustainable, affordable and transparent.

An in-depth post-construction evaluation will be carried out that includes a cost comparative analysis of the projected material and labor costs with those of the detailed costs that were tracked during the construction process. This evaluation and comparative analysis, combined with quantitative data obtained from Hydro-Quebec meters and the Concordia University study, will allow the CNE to make improvements aimed at ensuring the performance of the net-zero energy building system. Lessons learned from the construction of the Accessible House will be used and scaled to the Six-Plex. From its experience during the pilot project phase, the CNE will select the materials for the construction of the Six-Plex and future single-family homes.

The CNE has already identified transportation times as a significant factor in project delays and costs, especially in remote communities, as well as the inability to store enough construction materials on site to ensure continuity of work on projects. To address this issue, in 2019, the CNE will construct or rehabilitate a facility where construction materials can be stored and building components can be assembled. This is a significant change in how construction projects are usually managed in Eastmain where materials are purchased only when construction is to start, with delivery occurring much later, leading to work stoppage when supplies or materials run out as well as delays in starting construction. By having a storage facility on-site, the CNE can time its purchasing to get a better price on materials, buy in bulk, and be in a position to commence construction immediately. This approach will also permit the CNE to maintain and control an inventory, reduce wastage and prevent the deterioration of materials.

In 2020, the CNE will construct a single-family home and one Six-Plex. In addition, the CNE will retrofit four existing residential units. To retrofit existing homes to net-zero energy standards, the CNE will incorporate a super energy-efficient "wall panel system", in conjunction with construction techniques that will enhance the energy efficiency of foundations and roofs.

Keeping in mind the goal of building a strong community, the NZE program includes various opportunities for capacity-building and economic development.

Timelines and Deliverables

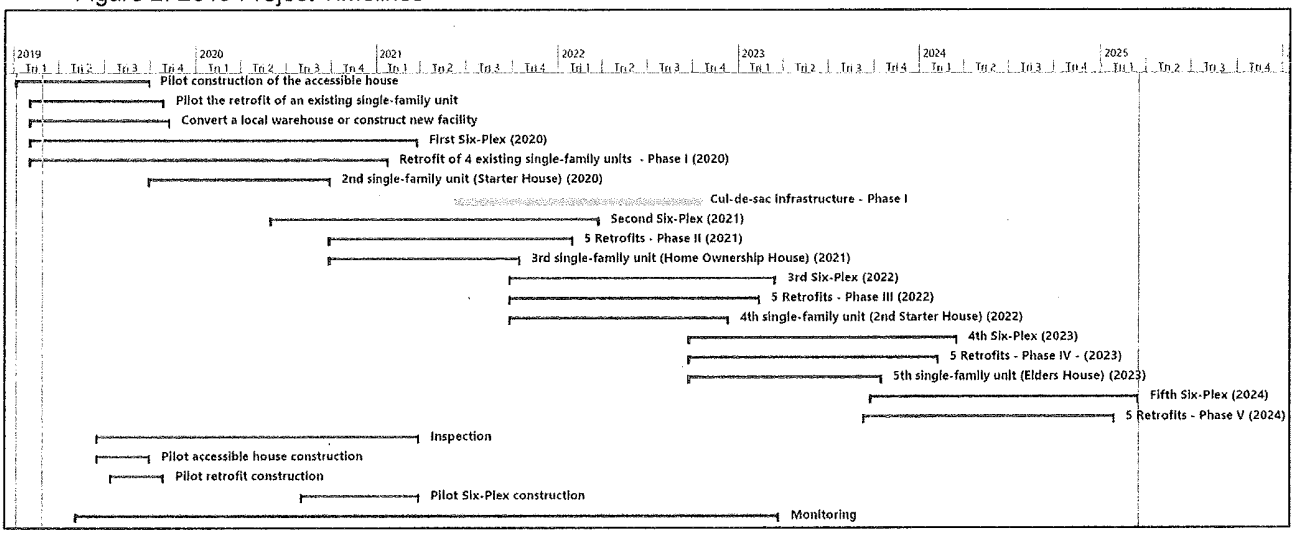
Our NZE program is a multi-year, multi-phase project during which the CNE will construct single-family homes and multi-unit buildings and retrofit existing homes. In year 1, 2019, the CNE will construct, as part of a pilot project, an NZE single-family Accessible House and retro one existing home. In the second year, the CNE will build one NZE Six-Plex and one single-family home and will carry out NZE retrofitting of four homes. In 2021, and for

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all the subsequent years, the CNE plans to construct one Six-Plex and one single-family home, except in the last year, and carry out 5 retrofits following the 2020 schedule.

The below tables set out the timelines for the NZE program.

Figure 2. 2019 Project Timelines



Payment Schedule

The CNE has based the payment schedule on the above timelines. The payment schedule is intended to reflect the amounts needed to successfully complete the activities within the established timelines.

Payment Schedule

With these and the projected construction costs, training costs and other related costs, the CNE has established the following payment schedule for the Smart Cities Challenge prize money that is reasonable and rational.

Table 2 – Payment Schedule

Year Ended	Year Ended	Year Ended	Year Ended	Year Ended	Year Ended	Total
31-Mar-20	31-Mar-21	31-Mar-22	31-Mar-23	31-Mar-24	31-Mar-25	
Proforma	Proforma	Proforma	Proforma	Proforma	Proforma	
$517,285	$1,160,551	$1,225,331	$1,063,633	$1,033,200	-	**$5,000,000**

Quantitative and Qualitative Indicators

The CNE has established a collaborative relationship with Concordia University and McGill University for the purpose of permitting the collection and analysis of quantitative

academic partners
- data
- analysis
- results

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and qualitative data. This data, which will allow us to measure the success of the NZE program, includes

- air quality
- thermal comfort through
  - objective measurements on energy efficiency
  - resident's self-reported assessments of thermal comfort
- energy consumption
- energy production
- Potential moisture issues in building components
- decay heat loss
- energy use trends
- well-being, based on indicators like
  - satisfaction with new home designs and retrofitted homes
  - thermal comfort
  - sense of home
  - quality of life
  - social inclusion, including socioeconomic indicators

Quantitative Data Measurement

The technologies to be implemented in this project are innovative and new to the region. The performance data to be collected is invaluable to validate their (a) application and (b) long-term performance, and to (c) improve the design, construction and operation of net-zero energy homes in northern regions.

Field data to be collected will be used to determine the (a) actual net-zero energy status of the homes, and (b) understand occupants' interaction with and operation of net-zero energy homes (like the set-points of indoor temperature, operation of HRV and air source heat pumps, window use, etc.). This data on indoor environmental quality will also be used in the qualitative study to assess the well-being of occupants with respect to the physical environment.

Qualitative Data Measurement

McGill University will conduct surveys and group meetings and attend Cree Cafés to collect information relating to occupants' experience in net-zero energy homes and retrofitted homes. The data will measure, amongst others, the (a) level of satisfaction with home designs and layouts, (b) operational functions, (c) compatibility with Cree culture and (d) pride in ownership.

Energy Modelling

The CNE will carry out detailed comprehensive energy modelling of the single-family home, the Six-Plex and the net-zero energy retrofits using Integrated Environmental

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Solutions (IES) or Energy Plus systems and drawing upon the lessons-learned during the construction of the Accessible House. The energy modelling will consider the effects of (a) night-time free cooling, (b) crawl space thermal mass and (b) shading to eliminate or reduce the use of air-conditioning, and provide recommendations aimed at improving the resiliency of the net-zero energy homes constructed in Eastmain.

The activities carried out during the comprehensive energy-modelling will include

- energy modelling based on the actual designs
- comparison of the energy-modelling results to HOT2000 software results
- optimization of the passive design and integration of the proposed technologies
- calibration of the comprehensive energy modelling with the field monitoring data collected on the Accessible House to optimize the design and construction of NZE homes
- hygrothermal modelling using the software WUFI Pro, calibrated with field measurements, that will be used to design alternative moisture-resistant envelope assemblies for net-zero energy homes in other climatic regions.

Monitoring, Reporting and Evaluation

Monitoring

The CNE and its partners, Concordia University and McGill University, will carry out various monitoring activities that will enable them to ascertain the success of the NZE program.

The sensors installed in the homes will collect important data that will be communicated through the battery operated dataloggers to a web-connected computer managed by the Cree Nation of Eastmain's Housing Department. The data will then be anonymized before uploading to an analytical website where it can be analysed by Concordia University. In addition, Concordia University will conduct quantitative studies on the air quality and energy consumption of a sampling of each of the housing prototypes constructed under the NZE program and the net-zero energy retrofit homes.

McGill University will analyse occupants' experience in the NZE homes and retrofitted homes. The well-being of the occupants will be measured and monitored over time using a range of indicators as described in the previous section. Data will be collected each year, using survey questionnaires administered to all Eastmain residents. This process will allow McGill University to monitor any change in the sense of well-being over time for Eastmain residents who move into NZE homes or whose homes are retrofitted and compare this to those residents whose housing situation does not change.

Given that smart meters have been installed on most homes, the CNE will seek to obtain quantitative information from Hydro-Québec respecting the energy consumption of each home. Using baseline data on non-NZE homes, the CNE will be able to determine if the NZE program is achieving its objectives and measure this achievement.

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Controlling the costs and timelines for constructing NZE homes requires consistent monitoring. As part of its NZE program, the CNE will establish a supply management system. This system will enable better monitoring and control of construction materials and their costs, including the transportation costs, as well as ensuring timely ordering to avoid delays.

Field Monitoring

Field monitoring will enable the CNE to identify any deficiencies in the program and ensure that the lessons learned through monitoring are applied to the NZE program. This will ensure that the NZE program is constantly adapting and improving to correct those deficiencies identified, if any, and responding to the needs of the community.

The monitoring protocol developed in year one of the NZE program will be applied to the construction and retrofitting projects in subsequent years. In year one, the Accessible House, scheduled to be completed by September 2019, will be monitored. The data collected through monitoring will be used to validate the design and construction techniques used, correct any issues, and incorporate design alterations to make improvements to the building's performance. For housing projects constructed in subsequent years, a similar data collection plan would be implemented for performance comparisons. Field monitoring will include:

- hygrothermal performance of the building envelope to ensure durability
- indoor environmental quality including
  - indoor air quality
  - thermal conditions
- energy performance including end energy use of
  - HVAC equipment
  - lighting
  - appliances
  - any other equipment
- energy generation of photovoltaic array

Concordia University will visit Eastmain twice during each construction season. The first visit will take place after the framing and roofing have been completed to install sensors and dataloggers, conduct blower door tests and seal any openings in the building envelope. Once construction is substantially completed, Concordia University will return to Eastmain to install energy monitoring equipment on the different systems, ensure the proper functioning of the sensors previously installed and conduct a second blower door test.

Hygrothermal Performance

The hygrothermal conditions, including the relative humidity and temperature (RH/T), of the envelope assemblies such as the walls, roof, attic and crawl space will be monitored. This data will be used to assess the risk of moisture-damage arising from condensation,

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decay and mould growth. An on-site weather station will be installed to monitor the wind speed, wind direction, rainfall intensity and global solar radiation. The weather station data will be used to correlate the hygrothermal performance and energy consumption and production of the NZE homes with local weather data for field data analysis and model validation.

Indoor thermal conditions and CO_2

RH/T and CO_2 sensors will be installed in indoor spaces to monitor thermal conditions and indoor air quality, thus enabling the CNE to confirm that indoor air quality standards are being met in the NZE homes and retrofits. This information will also be used to assess performance of the HRV system and determine if it is delivering sufficient ventilation to the housing units. Indoor RH conditions when combined with temperature data, will be used to assess thermal comfort. The RH data will also be used to determine the moisture loads for hygrothermal modeling to evaluate the resiliency of the NZE homes.

Energy Monitoring

Understanding and evaluating energy use and production in NZE homes is paramount to successfully achieving high performance and annual net-zero energy use. Both energy consumption and production patterns will be monitored. Monitoring will measure

- energy consumed by discrete building systems will be monitored, including
  - the air source heat pump and ducted mini-split (Heating)
  - ventilation fans
- appliances, including
  - stove
  - dishwasher
  - washer
  - dryer
- plug loads and lighting (other than those attached to building systems and appliances)
- Heat Recovery Ventilator (HRV), including
  - temperature conditions on all 4 sides of the HRV to calculate efficiency
  - temperature readings at exhaust inlet/outlet and supply inlet/outlet
  - air flow rates
- electricity produced by the solar PV array

The monitoring protocol and modeling strategies developed during the NZE program can be implemented in other northern communities, including remote, northern off-grid communities, to investigate options for the design, construction and technologies of net-zero energy homes. The protocol will also be useful for developing the framework/guide for creating successful, affordable and resilient net-energy zero housing.

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Risk Management

Identification of Risks

Table 3 – Performance Measurement Risks and Mitigation Strategies

Risks	Preventive Measures	Corrective Measures
Power loss to data loggers	Install data loggers with a battery backup and regularly verify power	Replace battery
Loss of internet connection		Data collected from sensors will be stored in a local computer until connection is restored and then will be transferred*
Faulty sensors	Test sensors prior to installation and after installation to ensure proper functioning and accuracy	Replace faulty sensors
Power loss to data collection computer	Use a battery power supply and an uninterrupted power supply (UPS)	Use backup Laptop computer Reboot computer when power is restored*
Data collection program crashes	A script has been written to force laptops to automatically reboot at certain intervals to ensure performance	Laptop will be restarted manually if necessary*

** On-site support is available in Eastmain allowing remote troubleshooting*

CHAPTER 3: PROJECT MANAGEMENT

The CNE has put significant effort into establishing a project management framework that will cover all phases of the NZE program. From identifying resources and needs to develop resources locally, to identifying the accounting, monitoring and reporting methods the project management plan proposed by the CNE will ensure the success of our NZE program.

To be long-term, the NZE program must look to the future and find ways to bind the community to the program. The CNE therefore established partnerships aimed at building capacity locally in the trades and specialized fields. This will guarantee success of our NZE program as Eastmain becomes more self-sufficient and its residents have opportunities to grow and create better lives for themselves and their families.

Project Scope and Scheduling

Project Scope

The NZE program consists of several projects and phases. Starting with the construction of a net-zero energy Accessible House and NZE retrofit. In support of this program, the CNE will establish a warehousing and inventory-costing system. In the subsequent years, the CNE will add on projects in a carefully thought-out sequence, that will include an Elders House and Private Homeownership Houses.

In preparation of the NZE retrofit project, the CNE has availed itself of an Indigenous Services Canada initiative to carry out an inspection and full-scale assessment of 24

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existing houses in Eastmain. The inspection will include an estimate of the costs of renovation and an appraisal of the house. The data obtained from this will assist the CNE in identifying the houses to be retrofitted under the NZE retrofit program.

The NZE program also consists of ancillary projects that will support the program. These include the construction or rehabilitation of a facility for warehousing construction materials and assembling building components. This facility will enable capacity-building and create employment and economic development opportunities for the residents of Eastmain, which in turn will pave the way toward creating a strong, healthy community.

Resources Assessment

The CNE has the human, material and financial resources needed to make its NZE program a success. By phasing in the projects to be completed as part of the NZE program, the CNE will also ensure that it has the experience and capacity for each phase. This will also give it time to create capacity where needed.

Table 4 – Resource Assessment

Workforce Capacity		
The CNE has the human, material and financial resources needed to make its NZE program a success. CNE's construction company, Stajune Construction Inc., has experience carrying out large and smaller scale projects in Eastmain. An inventory of workforce resources has allowed the CNE to identify lacunae in the community and the areas where capacity-building must be focussed. In the interim, there are specialized tradespeople in other Cree communities and nearby Quebec cities who are eager to work on the pilot projects, while the CNE builds up its local capacity.		
Project management capacity	Experienced project manager	
	Housing specialist	
	Design consultant	
	Civil engineer	
	Chartered Accountant	
Trades capacity	**Trades**	**Quantity**
	Foreman	3
	Carpenters	21
	Machinery operator	16
	Plumber	0
	Electrician	0
	HVAC	0
Infrastructure readiness		
The CNE has **30 fully serviced lots ready** for new NZE homes. Eastmain has a **complete fiber optic infrastructure** throughout the community. This will enable long-term data monitoring and residents' access to the information obtained through the NZE program. There are local **warehouse facilities** where construction materials can be stored and building components assembled of. The CNE plans **to build or to renovate a warehousing facility** to store construction materials and assemble building components.		

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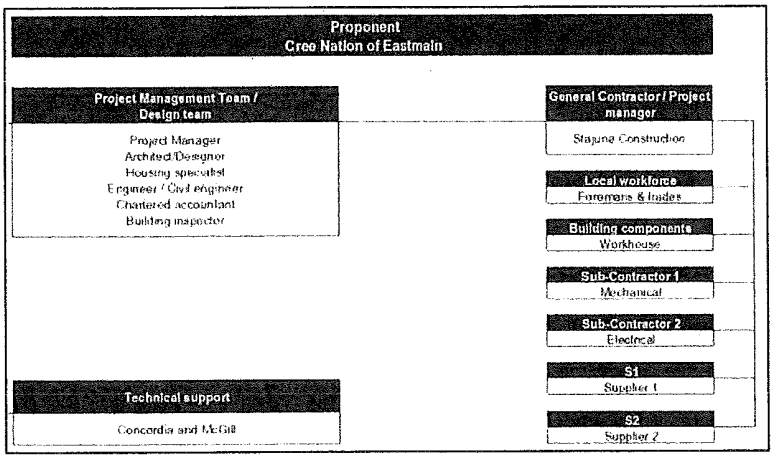
Workforce Capacity

The CNE will work with its construction company, Stajune Construction Inc., to implement the NZE program, each operating in their sphere of activity toward the success of the whole program.

The success of the NZE program rests on having a good foundation. In this case, the foundation is the project management team that will oversee the projects carried out under the NZE program and support to Stajune Construction in its management of the construction projects and cost control. The NZE Project Management Team will be made up of the resources identified in Figure 3.

The NZE Project Management Team has over 90 years of combined experience in finance and administration and 80 years in the construction industry. Project Management Team expertise includes financial management, LEED certification, super energy-efficient building techniques and northern and remote housing. The Team further benefits from the partnerships established with universities, government agencies and industry experts who have been involved in our NZE program.

Figure 3. Project Management Flow



Stajune Construction will act as the general contractor/project manager of the NZE construction projects. Work will be subcontracted out to local companies and entrepreneurs operating in the construction sector. The CNE has held consultations with local contractors who have all indicated their willingness to work collaboratively on the NZE projects. These contractors understand the critical issues and the importance of completing the various projects on time and on budget.

Current Workforce

In February 2019, the CNE held a construction meeting for the purpose of inventorying certain trades in Eastmain.

This inventory has allowed the CNE to identify lacunae in the community and the areas where capacity-building must be focussed. In the interim, there are specialized trades in other Cree communities and nearby Quebec cities who are eager to work on the pilot projects, while the CNE builds up its local capacity.

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Although the CNE did not do an inventory of general labourers, a Cree Nation Market Survey compiled by Cree Human Resources Development (CHRD), there are approximately 17 men and 22 women looking for employment in Eastmain. Given that Eastmain's total workforce is 498, this yields an unemployment rate of approximately 8%.

Capacity-Building

To be meaningful and impactful to the community, the NZE program must be sustainable well beyond the scope and timelines of the Smart Cities Challenge. The CNE must therefore ensure that it can develop the capacity of the local workforce. Throughout its NZE program, workers will develop specialized skills including

- net-zero energy building techniques
- wall systems construction
- flooring
- cabinetry
- electrical and plumbing
- HVAC installation and maintenance
- roofing
- retrofitting

Planning for capacity-building activities has already started. The CNE is currently working with potential partners who are experienced net-zero energy builders, to provide work placement training. Four carpenters have been identified for training on net-zero energy construction techniques and systems. The training will give these workers the skills required to carry out and supervise net-zero energy construction.

In addition, two CNE employees will also receive work placement training on net-zero energy retrofits. These employees will work with our partner on a retrofit project to be carried out between March and April 2019. The retrofit training will include

- air tightness principles and techniques
- net-zero energy techniques
- wall systems construction
- digital capture techniques for dimensioning existing buildings
- supervising net-zero energy housing projects
- the do's and don'ts in retrofit projects

As part of the training, the partner will conduct follow-up site visits during the construction phase of our NZE projects between 2019 and 2020, thus ensuring the net-zero energy skills are fully integrated and rooted in Eastmain.

Other trades people have expressed an interest in receiving training in electrical and plumbing and HVAC installation and maintenance. The CNE will work with the Cree School Board and its partners to identify training opportunities for local trades. More

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specifically, the CNE will begin exploring programs with the Cree School Board, CHRD and other vocational schools that offer certification programs in electrical, plumbing, carpentry and heating and ventilation systems. Ideally, training will be provided during the Smart Cities Challenge projects, with the goal of developing these skills in Eastmain within a five-year timeline. The CNE intends to invite skilled external tradespeople to Eastmain to work on NZE projects who will be required to hire local apprentices. It is anticipated that this approach will reduce construction costs because the use of external contractors generally means higher hourly fees and costs associated with travel, and room and board.

The CNE will not only focus on the trades side of the NZE projects but will also identify training opportunities aimed at augmenting project management capacities locally. Eventually, the CNE intends to have local people trained as certified project managers through the Project Management Institute. More importantly, the CNE will look to obtain comprehensive training in cost accounting and MS Project.

One identified area of concern is the need for qualified building inspectors. In fact, the lack of qualified building inspectors who can verify that homes and other constructions have been built to National Building Code standards is often cited as an underlying, contributing factor in the quality of construction projects in the Canadian north. Meanwhile, the CNE is presently training Home inspectors through a program funded by CHRD and offered by Cree Nation Government. These newly qualified Home inspectors will be instrumental in recommending suitable homes for NZE retrofitting to the Cree Nation of Eastmain.

The CNE has also identified other opportunities for capacity-building of the local workforce. These include

- collaborating with the National Research Council (NRC) to develop building science and related construction skills through seasonal employment of a local Indigenous engineering student on NRC building science research projects
- collaborating with Concordia University Department of Building, Civil and Environmental Engineering and the Centre for Zero Energy Building Studies to develop engineering and building science skills in Eastmain, which has a long-term goal of having a Cree engineer and encompasses the opportunity for a local Cree student to
    - work with the Concordia University data monitoring team to install equipment and collect data on our NZE projects
    - assist with project oversight and data collection relating to, amongst others, materials, production by trades and costing
    - enroll in the Engineering Co-op program and have a summer co-op placement in Eastmain

Financial Resources

Both the CNE and Stajune Construction are subject to independent public audit by a financial auditing firm. As part of the Cree Nation of Eastmain's IMS implementation, contractor and supplier management will also be audited throughout the NZE program.

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With the exception of the Smart Cities Challenge winner's prize and revenues that will be generated through the lease or sale of housing units, funding for our NZE program has been secured. In identifying funding, the CNE did not identify government and agency funding programs that may be accessed to complete projects under the NZE program because these must be applied for and, until approved, cannot be considered secured sources of funds. However, the CNE will apply for available funding under different programs.

The CNE financial resources include allocations from the CNE Local Economic Development Fund, the annual subsidies for housing and infrastructure under the Infrastructure Fund, funds from the Housing Action Plan and Cree Nation Government regular program subsidies.

Infrastructure Readiness

The actual construction of net-zero energy homes means that there must be sufficient space and adequate infrastructure to support the new construction. The CNE has recently completed a geomorphic study of the entire community.

Weather is always a risk in the James Bay region. Cold temperatures and snow can arrive early and often stay late into the construction season. The CNE knows that weather often results in delayed completion of construction and the deterioration of materials purchased for projects. While the CNE cannot control weather, it can take steps to mitigate the impacts weather has on its NZE projects. In order to attenuate the impacts that the northern climate has on the timely completion of construction projects and the inherent costs arising from delays, the CNE plans to establish a warehousing facility. The facility will be used to inventory and store construction materials and to assemble certain building components. More importantly though, by having a local warehouse, the CNE can order materials and supplies in bulk for projects before the start of the construction season, avoiding the added delays resulting from transportation times.

The CNE has carefully considered two options for such a facility. An existing warehouse in Eastmain that can be renovated to accommodate the needs of the NZE program, or the CNE can construct a new building. Each option was costed. Renovation of an existing warehouse will cost approximately $450,000 while a new build comes in at around $1,464,613 of which up to 70% can be leveraged through capital funding programs which amounts to almost $1,000,000 of the total cost. This brings the costs of a new build in line with those for the renovation.

The new build, as costed, would be significantly larger, at 8,100 square feet as opposed to 3,500 square feet for the existing facility. In addition, this facility will also be used for the assembly of building components thereby reducing construction times and lowering construction costs while creating employment and economic development opportunities in Eastmain. In light of these benefits, the CNE has chosen to proceed with applying for funding for the construction of a new facility. If approved, the CNE can proceed with construction in 2019. If the CNE is not allocated funding under these programs, it will

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examine the advantages of renovating an existing warehouse versus scaling the new build smaller in order to be able to carry out construction as funds becomes available.

Table 5 – Comparison Facility New Build vs Renovation

Options	Description	Building area (sq2)	Cost
1	Existing warehouse renovation	3,500	$450,000.00
2	New building	8,100	$1,464,613 (which includes a maximum grant up to $1M)

The facility, if a new build, will be owned and operated in partnership by the CNE and Stajune Construction as a community project. The new facility would also serve as the offices of the CNE Housing Department and as a maintenance shop. The Housing Department will be responsible for the areas of the facility where bulk ordered construction materials for NZE homes are stored and for the Housing Department's preventive maintenance programs. Another area of the facility will be used for the assembly and storage of the building components.

The facility will allow for the assembly of building components during the months of November to May, eliminating costs that occur from building during winter conditions. As well as increasing the length of the building season, the facility will also take advantage of being able to carry out work in a facility that is dedicated specifically for constructing building components such as wall panels.

The stored materials will be used for housing units constructed under the Smart Cities Challenge, band housing, ongoing housing preventative maintenance programme, the construction of cabinets and the resale of building materials to Eastmain residents who have no local option for attaining building materials for household projects.

In the event the facility is not completed before the CNE must order materials for year 2 of the NZE program, there are other warehouse facilities in the community. These can be used on a short-term basis to store construction materials delivered before completion of the facility and to assemble the building components that will be needed in the upcoming projects.

Project Management Strategies

Our NZE program is ambitious and large-scale. With so many areas of activity it is essential to come up with strategies for addressing issues, managing procurement and supply chain, ensuring outcomes are impactful on the stakeholders and that communications enhance community inclusion. The CNE has systems and processes already in place that are the foundation to its project management strategies.

Risk Identification and Mitigation

All projects face challenges that threaten their success and none more so than construction projects that are vulnerable to weather, supply, transportation and many

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other factors. The CNE and its partners have identified these risks and designed strategies aimed at avoiding these risks or mitigating their impact on the NZE program.

Since being selected as a Smart Cities finalist, the CNE has identified certain risks that it mitigated by adjusting its NZE program to ensure it can achieve the stated outcomes. More particularly, the CNE had concerns that the timelines, vis-à-vis its present capacity, and financial resources put at risk the success of the NZE program. Consequently, the CNE has modified the timelines and milestones, setting attainable objectives and phasing in parts of its NZE program. By starting with smaller, more contained projects, the CNE will be able to test its processes and procedures and validate its choices to ensure the success of the NZE program.

CNE has also had to re-evaluate its initial proposal after it carried out program costing. Presently, there are no programs in Quebec that support residential applications of solar and alternative energy. As a result, the inclusion of certain net-zero energy technologies added significantly to the costs of construction of NZE homes. In order to control these costs, the CNE has considered constructing net-zero ready homes provided that these homes achieve near net-zero performance and offer the same characteristics in terms of design and resilience. And develop a local "Green Technologies" program to subsidize the purchase and installation of solar photovoltaic systems, similar to programs in other provinces.

There are also risks inherent in relying on technology which may be protected by patent or copyright, difficult to obtain or service or subject to frequent modifications. By relying on commercially-available technology and equipment the CNE will be reassured of their quality and availability as well as the ability to obtain professional technical support when needed.

Table 6 – Risk Analysis

Cause	Risk	Mitigation measures	Risk (3 to 1)
Lack of available workforce	Failure to attain level of local capacity needed for projects	▪ Recruit locally for skilled trades ▪ Train additional tradespeople ▪ Contract/hire externally	2
Design flaws Energy modelling based on assumed data Quality during construction	Failure to reach net-zero targets	▪ Carry out additional data modeling using alternative programs ▪ Use data from weather station to verify assumptions in energy modeling ▪ Re-evaluate NZE construction details and technologies ▪ Implement inspection program and increase frequency of site inspections ▪ Augment net-zero construction training for skilled trades	1
Incorrect estimates of quantity of materials needed Construction modifications on site	Insufficient inventory of construction material	▪ Implement inventory control system ▪ Order materials 8 months before project start date ▪ Order needed materials for shipment to warehouse ▪ Evaluate and improve inventory control and estimates exercise	2

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Unexpected events on site Weather Extra work on site Incorrect productivity and work duration estimates	Failure to meet construction timelines	▪ Apply contractor/supplier management best practices ▪ Apply contract reward/penalty clause ▪ Hire experienced construction PM ▪ Use a project management software ▪ Conduct periodic evaluations of construction and project management processes ▪ Hire additional skilled tradesmen ▪ Implement process improvement measures ▪ Adjust project scope and timelines	1
Unexpected events on site Weather Extra work on site Wrong productivity and works duration estimates Wrong cost estimates	Cost overruns	▪ Implement contractor/supplier management best practices ▪ Hire experienced construction PM ▪ Conduct audit on all construction and project management processes ▪ Adjust project scope and budgets ▪ Identify source of cost overruns and apply audit findings to improve efficiencies	1
	Inability to sell units if purchasers cannot obtain financing	▪ Pre-screen and pre-qualify purchasers ▪ Identify new purchasers ▪ Reclassify private homeownership unit as rent-to-own	2
	Contractor unable to secure necessary financing to carry on construction work	▪ Assist companies in accessing capital funds on a project-by-project basis ▪ Encourage partnerships and joint ventures between companies to improve financial capacity ▪ Manage the project directly through Stajune ▪ Increase CNE investment in the project	2
Fail to do credit check / obtain information on tenant financial capacity	Inadequate rent collection to support operation/maintenance of rental units and to build reserve funds	▪ Pre-qualify renters through credit check ▪ Verify capacity to pay ▪ Credit bureau reporting on delinquent accounts ▪ Ensure agreements are fair to CNE and tenants but protect CNE investment ▪ Terminate rental agreement and evict delinquent tenant ▪ Require solvent co-signer on rental agreements ▪ Sanction arrears by forfeiture of CNE subsidies and application of grants to rental arrears ▪ Suspend eligibility for CNE grants, loans and subsidies to persons with rental arrears ▪ Take legal action	2
Incomplete surveys or site inspection	Ground bearing capacity too low (geotechnical)	▪ Verify ground composition with a geotechnical survey ▪ Mention geotechnical details in contract documentation ▪ Install piles or other system to reinforce foundations	2
	Incomplete building design	▪ Foundation modifications with geotechnical survey ▪ Verify design exceptions (solar panel, insulation, etc.)	2
	Lack of interest from buyers	▪ Explain NZE experience by using pamphlets ▪ Bring out the difference made in community and chance to realise unique projects	2
	Experience in NZE units does not meet occupants' expectations	▪ Confirm occupant satisfaction with the design ▪ Ensure design meets occupants' need before occupancy ▪ Conduct extensive and redesign of future housing units	2
	Negative reaction to living in multi-unit housing	▪ Evaluate underlying issues affecting satisfaction ▪ Elaborate construction strategies to address these issues ▪ Conduct consultation to identify occupants' concerns and needs	2

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		▪ Develop and implement a strategy that addresses these issues	
	Improper use of building technologies (smart, HVAC, alternative energy, security)	▪ Pre-occupancy education and training ▪ Create/distribute information pamphlets and labels ▪ Carry out inspections and surveys ▪ Train occupants in the use of all technologies	**2**
Incomplete information given to occupants on their role in NZE program	Occupants do not consent to the collection of personal information	▪ Explain stakeholder engagement that clearly adheres to all PIPEDA principles ▪ Restrict data collection to units where occupants gave consent ▪ Restrict data access to CNE or external, as the case may be ▪ Take steps to alleviate occupants' concerns with data collection	**3**
Mismanagement of data Database system incomplete or missing	Intentional or unintentional data loss or data security breach	▪ Execution of data storage and security agreements with partners based on PIPEDA principles ▪ Application of CNE ISO/IMS and audit programme ▪ Institute preventive measures and corrective actions identified in the audit programme ▪ Re-evaluate and make necessary changes to data access and security arrangements	**2**
Collaboration contract not made Terms of the research were not explained or well understood	Resident disengagement from long-term research activities assessing impacts on well-being	▪ Conduct community meetings with partners to discuss relevancy of project objectives to residents' needs ▪ Establish communication plan to engage meaningfully with residents through sharing circles, social media and other forums ▪ Adapt the project continuously to reflect community feedback ▪ Communicate with local CMC workers to identify and address barriers to community engagement	**3**
	Housing assignment leads to real or perceived iniquity amongst CNE members	▪ Conduct analyses of changes in home and health status and health over time ▪ Identify at-risk sub-population groups based on analyses ▪ Adapt housing policies to implement suitable interventions to populations groups most at-risk for housing inequities	**2**

*Note: highlighted risks directly linked to KPIs in Table 11.

**Note: floor plans were designed to allow living area to be reduced by removing rear section from first floor.

Procurement

In order to control the costs of the NZE projects, the CNE has created a procurement strategy. The strategy was developed with significant consultation with industry stakeholders to ensure its feasibility.

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Table 7 – Procurement Strategy

PURCHASING & EXECUTION STRATEGY			
Purchasing strategy	▪ Benchmark ▪ Use of local workshops ▪ Material transport optimization ▪ Use of cost comparison sheet ▪ Use of progressive billing for each contract ▪ Apply holdbacks ▪ Detailed cost breakdown ▪ Formal tendering process ▪ Use of templated CNE contracts prepared ▪ Bulk material ordering (see project execution strategy)	Project execution strategy	▪ Specially timed purchasing of construction materials ▪ Construct or rehabilitate a facility used to warehouse construction materials ▪ Implementation of processes for inventory control ▪ Purchase large quantity items and carry out procurement in the fall for the following year ▪ Invite specific suppliers to negotiate further on costing and quality of materials ▪ Prepare detailed list of materials used
Approved by	**CNE financial administration**	**Date**	

Important savings can be generated through bulk and specially-timed purchasing of construction materials. As previously explained, the CNE will construct or rehabilitate a facility that can be used to warehouse construction materials. This will enable the CNE to implement processes for inventory control which in turn will play a role in maintaining adequate inventory to complete projects on time and on budget.

Identifying what to purchase will be done when the CNE completes its pilot projects (Accessible House and 1st Retrofit) in year 1 and prepares a list of all materials used.

All procurement of materials and services must comply with the CNE Financial Administration By-law and established policies. This By-law imposes approvals procedures and certification of available funds prior to contracting. Any gaps in the By-law will be filled by procedures aimed at ensuring fairness, openness and transparency in the procurement process that favour accountability and responsibility.

The CNE has established relationships with suppliers to ensure that they understand the procurement process going forward. In addition, the CNE will ensure that it always has a Plan B with an alternate supplier in the event a selected supplier is unable to respond to the NZE project needs. Where appropriate, standardized, templated contracts prepared by the CNE will be used. These contracts set out clear deliverables, timelines and the obligations on each party to favour a constructive, collaborative relationship with suppliers.

Concordia University will be assuming responsibility of procuring the technologies to be used to monitor the performance of the homes. Concordia will contribute $25K to the purchase of equipment. The CNE is actively seeking additional partners to offset costs. If a partner is not found, the CNE will cover the costs through project funds.

Stakeholder Impact and Influence

There are several stakeholders in our NZE program. From residents to local businesses and outside suppliers to governments and agencies, our NZE program will impact these

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stakeholders in different ways. All stakeholders can impact the success of the NZE program and influence its implementation.

Stakeholder engagement will use the principles set out in the CNE Quality Management System and be auditable within the scope of our Information Management System (ISO/IMS).

Table 8 – Stakeholder Impact and Influence

Stakeholder	Impact on Stakeholder / Stakeholder influence on NZE program
Residents	Most impacted stakeholders as will have opportunity to own or rent an NZE home
	Success of private homeownership program will depend on interest in investing in houses
Suppliers	Impacted by new business and economic development opportunities
	Influence the affordability of NZE housing which will impact success of NZE program
Local Business	Impacted by employment and economic development opportunities
	Influence the success and affordability of our NZE program
Council	Impacted by success of program in fulfilling promise to create a stronger, healthier community
	Influence the success of NZE program through budgetary appropriations and funding
Government Agencies	Influence stakeholder policies and programs by the findings of monitoring and studies
	Influence the success of NZE program through funding programs and policies

Through the program, Eastmain residents will be the most impacted and influential on NZE program success. The opportunity to own a home is gaining momentum in Eastmain as a means for enabling residents who have the financial capacity to move away from the social housing program and fulfill a dream shared by many Canadian - that of having one's own home. Nonetheless, the sale of NZE Private Homeownership Houses will be dependent on the interest and motivation of residents to obtain loans through financial institutions.

The NZE program will have an impact on and influence the sense of community pride. To be enduring though, it is essential that occupants of NZE homes understand the functionality of these homes and the technologies used. The goal is to ensure occupants get the most out of their homes. Consequently, every occupant of an NZE home, regardless of the type of home, will receive training and information on the operation and maintenance of their homes including,

- the use of the monitoring equipment
- cleaning and replacing HRV filters
- programming thermostats
- monitoring solar energy production
- monitoring daily energy use

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Suppliers

Suppliers of construction materials will influence the affordability of NZE housing and the ability to sell Private Homeownership Houses in Eastmain. If the costs are excessive, this could prevent expansion of a private housing market. However, Suppliers will have an interest in ensuring success as this can lead to partnerships to provide construction materials to the CNE for its NZE program. The CNE will leverage the potential scope of its NZE program to ensure suppliers see long-term benefits in ensuring affordability.

Local Business

Local construction companies and tradespeople will directly impact the success and affordability of our NZE program. If the costs are excessive, this will limit the number of houses that can be built by the CNE and could put at risk its stated goal of addressing the housing crisis and building a strong, healthy community.

However, the NZE program will be very impactful on local construction companies and tradespeople. There will be substantial opportunities for local construction companies and tradespeople to specialize in assembling building components and gaining NZE building expertise, including opportunities to be licensed as carpenters, electricians, plumbers or HVAC technicians. Construction companies and tradespeople will be assured of year-round work since assembly would be done in the off-season. Moreover, the CNE has put time and effort into identifying and planning training to increase the numbers of skilled tradespeople.

Council

Council will influence the ability of the CNE to carry forward the NZE program. If adequate annual funding contributions are not approved for each of the six years, then the CNE may be unable to carry out all or certain projects in a given year. The NZE program will be particularly impactful on Council if it achieves the stated goal of reducing the backlog in housing and creating a healthy and strong community.

Government Agencies

Through their support of the NZE program, government agencies can influence its success. If funding is provided for training and certification opportunities, for green energy initiatives and for housing, this will supplement funding allocated by Council. This support will fuel immediate, short-term success but will also contribute to the sustainability of our NZE program.

Our NZE program could potentially influence government agencies' thinking and strategies on housing in Indigenous communities.

Communications

The CNE will continue its community engagement process including, the Cree Cafés, general assemblies, housing forums and special community meetings. This engagement process will enable the ongoing assessment of the community's NZE experience and aspirations.

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In the 2019-2020 fiscal year, the CNE will also start leveraging social media as a means to receive feedback on its NZE program. This process has already started as the CNE is planning to redefine and redevelop its website so that it offers more and better information to CNE members.

The CNE is also developing a training program for NZE home occupants on the functionality of their NZE homes. This program will include one-on-one sessions delivered by a Cree Nation Government housing specialist.

A project management communication plan was prepared and will be followed in order to implement the construction phase of NZE projects according key performance indicators[4], year after year through the whole project cycle.

Table 9 – Communications Strategy

Communication	Frequency	Goal	Responsible
Project team			
Project status report	Weekly	Review project status and discuss potential issues or delays	Project manager
Team stand up	Daily	Discuss team member activities of previous day and current day, and any obstacles	Project manager
Task progress updates	Daily	Share daily progress made on project tasks	Project manager
Project review	At milestones	Present project deliverables, gather feedback and discuss next steps	Project manager
Post-mortem meeting	At end of project	Assess what worked and what did not work and discuss actionable takeaways	Project manager
Project proponent			
Project status report	Weekly	Review project status and discuss potential issues or delays	Project manager
Project review	At milestones	Present project deliverables gather feedback, and discuss next steps	Project manager

Monitoring, Controlling and Reporting

Monitoring will be essential to ensuring productivity, scheduling and timeframe goals are respected. During construction, daily site visits and inspections will be carried out by the project manager and CNE building inspector. Both will report to the CNE on the advancement of the project(s) and any issues. This process will enable the CNE to monitor

[4] The KPIs are described more fully in the monitoring, controlling and reporting strategies section and Table 7 below.

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project deliverables and major milestones in each project and react, if required, to any issues in a timely manner.

The man hours worked, and all materials used will be recorded by an onsite foreman with respect to all labourers and construction material. Having this information is particularly important as it will ensure that the CNE can properly plan the costing and time requirements for the different housing projects.

Table 10 – Monitoring, Controlling and Reporting Strategies

Financial management
▪ SAGE 300 Premium with customized Cost Accounting modules ▪ MS Project Manager add-ons that is auditable to the International Financial Reporting Standards (IFRS) ▪ Chartered accountant

Project management
▪ Experienced project manager responsible for all the monitoring, controlling and reporting ▪ Record of worked man hours by onsite foreman. ▪ During construction, daily site visits and inspections carried out by the project manager building inspector

Technical monitoring			
Monitoring	**Inspection**		
Net-zero monitoring ▪ Hygrothermal performance of the building envelope to ensure durability ▪ Indoor environment quality including (air quality and thermal conditions) ▪ Energy performance including end energy use of HVAC equipment, lighting, appliances and equipment ▪ Energy generation of the photovoltaic system	**#**	**Phases of inspection**	**When**
	1	Foundation	Before backfilling
	2	Framework	Before door and window installation
	3	Tightness	Before drywall installation
	4	Exterior cladding	Before commencing exterior cladding
	5	Interior finishing	Interior finishing

The CNE has an asset management system that includes computerised preventive maintenance management system for the community, which includes the housing department.

An important part of the management plan will include the key performance indicators as presented below.

Table 11 –KPI Tracking

#	Title of Key Performance Indicator	Measure unit	Target value
1	Energy consumption of each unit	kW/h/year	Production equals consumption
2	Indoor environmental quality	Relative Humidity CO2	40– 50 % 350-1000 ppm.
3	Construction cost	$	< 10% budget overrun
4	Number of units	Number of units/year	As planned

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The logical framework below is a management tool that gives a summary of a project, in this case the Accessible House project, to describe the project objectives, methods for verification and risks on an outcomes-based methodology.

Table 12 – Logical Framework for Accessible House pilot

TITLE OF PROJECT: Accessible House Pilot Project	**Project Starts:** Jun 2019 **Project Ends:** Sep 2019 **Date Today:** Nov 2018	
DESCRIPTIVE LEVELS	**METHODS FOR VERIFICATION**	**PROJECT RISKS**
OBJECTIVES ▪ Design a culturally-appropriate accessible house adapted to special needs of individual confined to a wheelchair ▪ Develop construction details for attaining net-zero energy performance to reduce operating costs ▪ Determine level of solar production required to attain net-zero energy performance ▪ Evaluate and develop cost-effective construction techniques to ensure end costs are affordable for social housing	▪ Design verification through interviews with special needs tenant on satisfaction and responsiveness of lay-out ▪ Post occupancy energy monitoring of energy consumption patterns ▪ Verification of net-zero status, including energy performance of the solar system, through extensive energy monitoring ▪ Detailed post-construction evaluation of construction costs and a cost benefit analysis of the construction system and technologies	**OBJECTIVES VS OUTPUTS** ▪ House does not meet the needs of special needs tenant, his caregiver or medical support staff ▪ Building system is not cost-effective ▪ House does not attain net-zero energy status ▪ Tenant does not consent to disclosure of data collected on the project and unable to collect data on individual energy use patterns ▪ Selected tenant refuses to move in or fails to qualify for social housing
OUTPUTS (Expected Results): ▪ Completed Accessible House for Eastmain resident with special needs ▪ Energy monitoring over two years including detailed energy consumption and energy production data ▪ Reporting on the net-zero energy status of the house and its potential for certification as a net zero energy building. If net zero energy status is not attained, strategies for attaining this on subsequent houses will be developed and included ▪ Reporting on the net-zero energy building system, including a cost/benefit analysis of the net-zero building system ▪ Reporting on the house design based on feedback from the tenant, his medical support and the community	▪ Design verification through interviews with tenant on success of the design in addressing special needs ▪ Verification by building inspector that the house meets all code and other requirements ▪ Verification by an energy modeller that the design of the building meets net-zero performance ▪ Confirmation that all suppliers and builders/trades have been paid ▪ Signed lease agreement	**OUTPUTS VS INPUTS:** ▪ Tenant is not satisfied with the unit ▪ Local builders do not cooperate fully ▪ Supply chain is unwilling to negotiate effective cost saving measures ▪ Lack suitable lot for development ▪ Cost of construction is greater than available resources ▪ House does not attain net-zero energy status ▪ Adherence to all project management activities, timetables, and budgets ▪ Construction impacted by weather conditions ▪ Accessible House built according to plans and specifications
INPUTS: ▪ Significant community and individual engagement to develop designs that take into consideration cultural components ▪ Evaluation of the design must-haves of special needs tenant	▪ Submission of bids submitted by contractors and subcontractors ▪ Confirmation of available funds ▪ Preparation and execution of contracts and financial documents ▪ Completion of Tenant Selection Form	**PREREQUISITE CONDITIONS:** ▪ Lot with the proper orientation ▪ Optimum roof angle to maximize solar performance ▪ Local climatic data ▪ Energy requirements of the home based on the building system

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▪ Evaluate the building system and the capacity required for the alternative energy system (solar) through energy modelling ▪ Develop plans for construction ▪ Engage with supply chain to establish a detailed materials list, costing and cost saving strategies ▪ Engage with local builders in elaboration of the building system and to identify the most cost-effective measures ▪ Engage experienced net-zero builders and skilled tradespeople familiar with the local environment ▪ Project management team experienced in net zero construction and cost accounting ▪ Capital development plan ▪ Available financial resources	▪ Confirmation of lifetime subsidy from CMHC ▪ Confirmation of mortgage from the bank ▪ Receipt of all plans and specifications for construction ▪ Adoption of Council resolution	▪ Calculation of energy needs and the size of the solar array based on energy needs to meet net zero ▪ Working drawings and detailed materials list ▪ Approved budget and secured sources of funding ▪ Contractual agreements that favour local capacity development ▪ Open book agreement with the construction companies to capture actual cost variables such as materials, labour, profit and administration ▪ Engagement with suppliers to develop ways to reduce material and delivery costs, and improve the stock of building supplies available within the community ▪ Occupant qualifies for social housing ▪ Project approval by Council

Sustainability

Table 13 – Sustainability Strategies

SUSTAINABILITY
STRATEGIES
The CNE has implemented various strategies which guarantee sustainability of the NZE program ▪ Taking a holistic approach ▪ Community members and stakeholders involved in defining and designing the NZE program ensuring the project can reach its full potential and respond to the needs of the community ▪ Laws, rules, guidelines and NZE projects discussed with suppliers and builders to ensure that they fully comprehend the framework and the expectations ▪ Through occupant feedback, the CNE will develop new designs and floorplans ▪ Rigorous monitoring and reporting requirements will enhance the level of trust residents have in the program **Training program** ▪ Training opportunities ▪ Hands-on training ▪ Certification opportunities: develop new skills or improve on current skills ▪ Business opportunities: new opportunities for employment and business development ▪ Lead to a stronger more economically and socially viable community The training and capacity building programs are being developed to enhance skills of local tradespeople with respect to net-zero energy construction and retrofits. Ensuring this capacity is essential for addressing the cost of constructing housing in the community, a key component in the SCC proposal. **Business plan for the development of the warehousing/building component assembly facility** This is being done for the purpose of developing a local housing industry and reducing the costs associated with private homeownership. The CNE will consider expanding the type of building components assembled to include roofing systems and foundation systems. This facility may allow the CNE to build a specialized sector supplying building components to other Indigenous and non-indigenous communities.

The CNE NZE program is guaranteed to be sustainable because of the holistic approach taken. From the beginning, community members and stakeholders have been involved in defining and designing the NZE program. This is essential to garnering the support

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necessary for such an ambitious program, ensuring it can reach its full potential and respond to the needs of the community.

The CNE has also discussed the laws, rules, guidelines and NZE projects with suppliers and builders to ensure that they fully comprehend the framework and the expectations but also adjusting the NZE program to respond to certain realities identified by the suppliers and the builders. This step ensures that the NZE program is affordable and therefore attainable.

The monitoring and reporting mechanisms put in place by the CNE will also facilitate the NZE program sustainability. Having rigorous monitoring and reporting requirements will enhance the level of trust residents have in the program and ensure that costs are consistent for each type of housing unit constructed. Past experience has shown the CNE and Eastmain residents that housing costs can vary significantly even for similar housing types built during recent construction seasons, which undermines residents' confidence in the residential construction industry.

Finally, sustainability depends on building capacity in Eastmain. Providing training opportunities, hands-on training, certification opportunities and business opportunities will enable Eastmain residents to develop new skills or improve on skills they already have and offer new opportunities for employment and business development. This can only lead to a stronger more economically and socially viable community and ensure that the NZE program can continue.

The training and capacity building programs are being developed to enhance skills of local tradespeople with respect to net-zero energy construction and retrofits. Ensuring this capacity is essential for addressing the cost of constructing housing in the community, a key component in the SCC proposal.

To continue its NZE program, the CNE is preparing a business plan for the development of the warehousing/building component assembly facility. The CNE will consider expanding the type of building components assembled to include roofing systems and foundation systems. This facility may allow the CNE to build a specialized sector supplying building components to other Indigenous and non-indigenous communities.

As long as there is a demand for housing our NZE program will continue well beyond the Smart Cities Challenge. Our approach has been to establish Eastmain as the expert in the region on building net-zero energy houses. There is a backlog of more than 3,600 houses in Eastmain and the other Cree communities in Eeyou Istchee. This means that the CNENZE program has the potential to continue well beyond the timelines of the Smart Cities Challenge.

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CHAPTER 4: TECHNOLOGY

Approach

The CNE's NZE program grounded on the use of smart technologies and construction technologies that are intended to enhance occupants' comfort and enjoyment of their homes and the homes' resiliency and efficiency.

While the developing the designs for the NZE houses entailed extensive community consultation, the design of the building systems and selection of the systems and technologies required to reach net-zero energy performance was carried out by a small technical team composed of experienced net-zero builders and a design consultant. The Team evaluated available technologies and construction techniques for the design of the systems to be used in the houses. Local builders were also consulted during this process to ensure that the systems and technologies identified for the project could be installed and maintained in Eastmain.

Energy Modelling

The first stage in the design of a net-zero energy building is to identify where energy consumption reductions can be maximized (through the building envelope, housing equipment and technologies) in order to lower the energy production needed to attain the net-zero energy target. This process included

- examining wall systems used in other net-zero housing projects
- drawing from lessons learned on super energy-efficient northern housing prototypes
- drawing from lessons learned on the modelling of other net-zero energy projects
- reviewing ongoing research being carried out in this field of work, including
  - *Panelized Building Systems for Northern Multi-Unit Residential Buildings*, prepared by Cold Climate Building Inc. for NRCan
  - *Design and Construction of Multi Unit Residential Buildings (MURBs) in First Nations communities: Challenges and Opportunities*, prepared for CMHC
  - *Net-Zero Energy Housing: CMHC's Equilibrium Program*

The Team put together by the CNE conducted energy modelling on the Accessible House and the Six-Plex[5] as these would be the first new housing projects constructed under our NZE program.

The Team first evaluated wall systems that had been successfully used on NZE houses in Edmonton, Alberta and other locations. An initial building envelope selection was made based on the experience acquired on net-zero single-and-multi-family builds. In addition to the requirement for net-zero energy performance, the Team took into account Eastmain's climate and the need for durable, easy-to-execute solutions that deliver good

[5] It should be noted that the Six-Plex is a multi-client build that offers the full range of occupancy: private homeownership, rent-to-own and social housing.

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occupant comfort and moisture control. At this early stage, the potential for prefabricating the system in a small local warehouse also became a significant consideration.

HOT2000 simulations were conducted on both the Accessible House and the Six-Plex using the same building envelope details for both. Several iterations were run as part of this exercise to test different combinations of building components (See Annex B, C, D and E).

At the same time, the Team ran a HOT2000 file using electric resistance heating and hot water and set the coefficient of performance of the cooling system to 1.0. The exercise delivered some surprising results with HOT2000 showing a cooling load in every month of the year – January to December – in the 7400 heating degree day climate of Eastmain. The annual cooling demand was greater than the annual heating demand.

Table 14 – Accessible House HOT2000 Results

	HOT2000 Homesol (kWh/a) (adjusted)	COP	HOT2000 Homesol (kWh/a) (adjusted)	HOT 2000 PA (kWh/a)	COP	HOT 2000 PA (kWh/a)	IES VE (kWh/a) w/ Heat Pump COPs
Annual Heating Demand	2774	1.4	1981	2650	1.4	1893	5535
Annual Cooling Demand	8617	3.5	2462	5293	3.5	1512	94
Annual DHW	4395	2.6	1690	5562	1.5	3708	2633
Lighting, Appliances, and Misc Electrical	7000	1	7000	6500	1	6500	6000
Total Annual Energy Required			**13134**			**13613**	**14262**

In both cases, the HOT2000 predictions for peak heating capacity seemed low when compared to the Team's experience with high-performance buildings in Edmonton's milder climate, while the peak cooling load seemed high.

Table 15 – Accessible House Heating and Cooling Loads

	HOT2000 (PA) Peak Watts	HOT2000 (Homesol) Peak Watts	IES VE Peak Watts
Design Heat Loss at -40C	3261	3100	5940
Design Cooling Load at 25C	1605	3600	2900

The results were far enough from expectations that the CNE commissioned ReNu Engineering to run a dynamic energy model using IES VE for comparison (See Annex F).

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Table 16 – Hot 2000 IES VE Energy Modelling Comparison

HOT2000 and IES VE Energy Balance for Accessible House	HOT2000 (kWh/a) (adjusted)	COP	HOT2000 (kWh/a) (adjusted)	IES VE w/o Heat Pump COPs (kWh/a)	COP	IES VE w/ Heat Pump COPs (kWh/a)
Annual Heating Demand	2774	1.4	1981	8500	2	5535
Annual Cooling Demand	8617	3.5	2462	329	3.5	94
Annual DHW	4395	2.6	1690	6583	2.5	2633
Lighting, Appliances and Miscellaneous Electrical	7000	1	7000	6000	1	6000
Total Annual Energy Required	22786		13134	21411.5		14262
Annual output from 45 – 330-watt PV modules	15500		15500	15500		15500
Potential Annual Surplus	-7286		2366	-5912		1238

An analysis of the results did not explain the departure from expected results. However, independent longhand calculations based on the hourly weather data for La Grand Riviere, Quebec, a location with similar climatic data, favoured the IES VE results. The Team therefore chose values closer to the IES VE results to calculate the net-zero energy balance.

HOT2000 results for the Six-Plex were similarly surprising. Although these results have not been tested against the IES VE energy model, it will be possible to utilize the significant extra roof capacity of the Six-Plex to install additional solar photovoltaics if it is necessary to increase energy production in order to achieve the net-zero energy target.

The energy modelling exercise was also used to determine the other technologies and building equipment needed to achieve the net-zero energy target. This included assessing windows (fiberglass frame, triple glaze, double low e and argon filled), appliances (top 20% Energy Star performance) and lighting (LED) as well as the size of solar array required.

Based on the modelling, the roof design of the Accessible House was modified to increase the size of the solar array. Modelling also disclosed that solar energy alone would not enable the house to attain the net-zero energy target. Consequently, the Team gave significant consideration to the desirability of using an air-source heat pump versus a ground-source heat pump to ensure net-zero energy performance. Even though lower in energy performance, the Team selected the air-source heat pump because of its significantly lower installation costs and maintenance requirements.

The super insulated envelope, air-tight construction, and energy recovery ventilation system allows for a 90% reduction in annual thermal energy demand intensity relative to typical construction. The significantly reduced thermal energy demand when combined with the high-performance mechanical system and on-site renewable energy generation allows for annual net zero energy consumption. This results in an annual greenhouse gas emissions savings of 861 kg CO_2 eq for the Accessible House as compared to standard construction techniques.

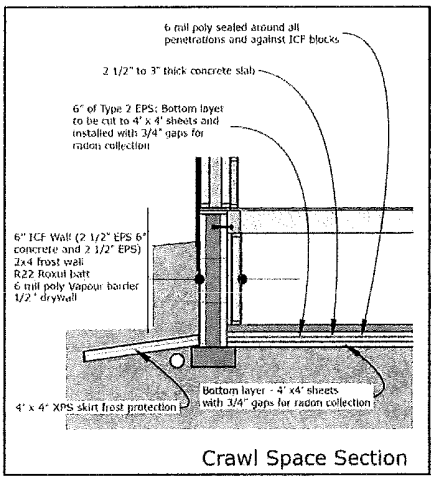
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The Building System

The selection of building materials and equipment were heavily influenced by Eastmain's remoteness and the impact this has on construction costs and housing affordability. The components of the building envelope were selected on the basis of their

- affordability
- durability
- ability to be constructed by local tradespeople
- ability to deliver the very high level of energy efficiency required for net-zero energy performance in cold climates

Figure 4. Crawlspace Detail.



Typically, houses in Eastmain have been built on full-height poured concrete foundations – a system that is known to be costly and a problem area for mould issues in many houses in the community. For this reason, there was considerable interest in exploring alternative foundation systems for houses to be constructed under the NZE program. Detailed costing and energy modelling were carried out on the use of slab on grade versus a frost-protected shallow foundation (crawlspace). While modelling showed there was very little difference in the energy performance of the two foundation types, consultation with local builders disclosed their concerns with slab on grade foundations vis-à-vis accessibility to plumbing and other household systems. Local builders also indicated that a shallow foundation was more feasible and made it easier to install services. In addition, the Team determined that the site preparation for a shallow foundation is simpler and less susceptible to inclement weather. Based on feedback and these other considerations, the Team selected a frost-protected shallow foundation for the CNENZE program.

The frost-protected shallow foundation will consist of a 4' high, 6" insulated concrete foundation (ICF) wall on an appropriately sized concrete spread footing. The crawl space will be sealed with a continuous air and vapour barrier and included in the heated envelope. The effective insulation of the foundation wall is R-43, the under-slab insulation is R-24 and the footing skirt is R-20. To minimize the use of concrete, an expensive commodity in Eastmain, the foundation wall was reduced to 6" and the under-slab to 3".

All houses constructed under the NZE program will have a double 2x4 cellulose filled wall with a protected interior air/vapour barrier and an exterior airtight water-resistant barrier. The assembly includes a 2 ½" interior insulated cavity to accommodate services. This assembly was chosen because it satisfies all the below criteria.

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- **The system is economical**
  Double stud 2x4 walls have been consistently shown to be the most economical method of building a high R-value wall, particularly when compared to the commonly used application of layering foam insulation to exterior of wall assemblies.

- **The system is durable**
  High R-value walls generally means a higher risk of condensation on the inside surface of the exterior sheathing. The Team has mitigated this risk in the selected wall system in several ways. Firstly, the wall system will use a well-sealed air-vapour barrier using taped foil-faced fiberboard to substantially reduce infiltration of moisture in the walls. Air leakage in the envelope will be reduced by using the Cossela Dorken Delta Vent SA, a sealed air-tight, vapour open, water-resistant barrier. In addition, the walls will be filled with cellulose insulation, which is highly hydrophilic, to absorb and allow the slow diffusion of any remaining moisture. Diffusion of moisture will be facilitated through diffusion vents installed high in each stud cavity, which will allow any moisture that does accumulate to escape into the vented rain screen. The R-values and air tightness are such that the inside surfaces will remain well above the dew point over a wide range of temperatures thus decreasing the risk of condensation and mould in the NZE houses.

- **The system materials are easily obtained**
  Other than the Delta Vent SA, the water-resistant membrane and the cellulose insulation, all the materials are readily available in Eastmain. The Delta Vent SA membrane and the cellulose insulation are easily found in the normal construction supply chain.

- **The system is buildable by the Eastmain workforce**
  Assembly of the wall system is very similar to standard western platform framing, a common residential construction technique used all over North America. The use of a 2x3 wiring chase inside a sealed foil-faced fiberboard vapour barrier is currently used in a housing project being constructed in Eastmain. The use of exterior rain screens is also common.

- **The system provides excellent energy performance**
  The wall system has an effective R-value of 53. Any increase in the R-value above this level would not be cost-effective because it would provide minimal additional energy savings at a comparatively high cost.

The Team selected fiberglass framed, triple glazed, argon filled sealed window units with 2-Cardinal LoE272 coatings. The roof cavity will be configured to offer a total R-80 (approximately 24") of cellulose insulation. The ceiling vapour barrier will be installed and sealed to the bottom of the trusses and supported with 2x3 strapping 24" on centre prior to building the interior partitions which will provide a chase for electrical wiring without penetrating the air/vapour barrier.

Particular attention was given to the selection of a Heat Recovery Ventilator (HRV). HRVs have been used in Eastmain homes for several years, but their performance has been inadequate. Often, the performance issues arise from improper HRV installation, or the

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decision by occupants to turn the HRV off because of (a) a misperception that these contribute to high energy costs, (b) noise, and (c) the impression that cold air enters the home through the HRV. The poor performance of HRVs in Eastmain, regardless of the reasons, reflects one of the ongoing challenges to maintaining healthy indoor environments in houses across the Canadian north.

In order to address this issue, the Team worked with an HVAC consultant to design an HVAC system for the NZE program. The Team carried out a second modelling exercise using dynamic IES VE 3D building performance analysis software to confirm findings and further evaluate air conditioning requirements. Based on this modelling exercise, the Team finalized the design of the building system and construction details and made changes to the roof design to allow for additional photovoltaics. The energy modelling was then finalized using these selections (See Annex G).

Our Technologies

A wide range of technologies will be introduced to the community through the CNENZE program. All these technologies, including new technologies not yet used in the community, are commercially available.

The technologies selected have a role in ensuring the NZE program attains the net-zero target, in monitoring and evaluating the houses and in building the houses. The Team evaluated energy saving and energy producing technologies including the building system (i.e. the design and construction of a foundation, walls and ceiling), building components (windows, doors, lighting, etc.), the HVAC system, and the solar photovoltaics.

Net-Zero Energy Housing

Although net-zero energy homes are not new to Canada, they are new to the Canadian North and to the Eeyou Istchee. Throughout Canada, innovations in the residential construction industry are developed locally and regionally, and innovations developed in one region must be tested in another. In each of Canada Mortgage and Housing Corporation's Equilibrium projects, for example, innovation focused on the specific combination of building systems and technologies that were used to achieve net-zero. For this reason, the Equilibrium programme targeted the development of net-zero energy housing prototypes across the country, except the north. The net-zero energy innovations also focussed on developing and refining construction processes to ensure that net-zero energy homes are competitive on a cost-benefit basis. This has been the same focus in Eastmain.

The CNE will ensure it builds capacity locally with respect to new technologies and systems being introduced into the community under the NZE program. As such, capacity building will be provided in areas such as solar photovoltaics, air-source heat pumps, energy monitoring technologies and smart home technologies.

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Net Zero Energy Technologies

The Team evaluated the energy saving and energy producing technologies required to satisfy a net-zero energy performance standard. The evaluation included selecting the materials required for the design and construction of the building envelope (i.e. foundation, walls and ceiling), the building components (windows, lighting, etc.), the design of the HVAC system and the size of the solar photovoltaic system. More specifically, the Team selected

- **Double 2x4 Wall System**
  The Team chose a wall system that is used extensively in Alberta, Saskatchewan and the Yukon. The system can be used on both new construction and on net-zero energy retrofits, and it can be assembled on site or prefabricated in a small local shop. This latter characteristic was important as it falls in line with the Cree Nation of Eastmain's plan to construct or rehabilitate facility where wall systems can be assembled locally. Even though prefabricated wall systems have been used in remote communities, the CNE project to create a facility where these can be assembled in a remote community is innovative.

- **Building Components**
  All the building components, including windows, doors, lighting and appliances were carefully selected to ensure that the wall systems would perform to a net-zero energy standard. The Team selected the following components for the NZE program, which will first be used in the construction of the Accessible House
    - Duxton Fiberglass frame, triple glaze, 2-low E coatings, argon filled windows
    - Energy Star certified LED lighting will be installed

- **Solar Photovoltaics**
  As well as being essential to achieving net-zero energy performance, the solar component of the NZE program could potentially satisfy household electrical needs during blackouts. The photovoltaic system that will be used in the NZE houses will be sized according to the net-zero energy needs of each house. All NZE houses will be designed so that the necessary solar panels can be installed directly on the roof of the house.

  In the case of the Accessible House, the solar array (i.e. the number of solar panels) is composed of 45 panels, each producing an output of 330 watts, to meet the energy production target of 14,309 installed watts. Electricity production from the solar array will be tied into the Hydro-Quebec electrical grid. Excess power produced through the solar photovoltaic system will be sold to the grid and bought back from the grid when supply from the system falls below household requirements.

- **Heating, Cooling and Ventilation**
  ReNu Engineering designed the HVAC system to satisfy the heating and ventilation needs of the house while ensuring the house can meet the net-zero energy target. The HVAC equipment includes

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- a VanEE 2400 (with an ECM fan) Heat Recovery Ventilator (HRV)
- a Fujitsu Halcyon Mini-Split RLS Air Source Heat Pump
- an AO Smith Proline XE HPTU-66N Hot Water Tank (HWT)

- **Wood Heat**
  The use of wood heat in residential applications in the North is common. Feedback from residents during the initial consultations on housing designs, many residents suggested using a backup wood heating system that will ensure houses can be heated during power outages. A Droulet Blackcomb air-tight wood stove will be installed in the Accessible House.

- **Smart Home Technologies**
  Equipment that will enable occupants to remotely monitor the operation of their homes, including
  - Z-wave enabled smart home accessories that monitor home security, water infiltration, frozen pipes and carbon monoxide
  - programmable smart thermostats

- **Appliances**

Occupants are responsible for obtaining appliances. However, to assist them with this task and ensure that every component in the house contributes to the net-zero energy target for that house, the CNE will give occupants a list of recommended ENERGY STAR® appliances. The recommended appliances must be affordable while also ranking in the top 20% of ENERGY STAR® rated appliances, a performance level that was determined through the energy modelling exercise. This will include a selection of refrigerators, ranges, dishwashers and washer - dryers.

- **Solar Generated Battery Storage**

Presently, the cost of battery storage for the loads required during the coldest winter months is prohibitive. The cost of solar panels has fallen dramatically over the past 5 years and a similar trend is starting to happen with battery storage systems. The CNE will track developments in the advancement of battery storage technology and expects that, over the next several years, the cost of battery storage will fall significantly. Battery storage will be introduced into NZE houses when the technology and the cost justify its use. When battery storage is introduced, it will be sized to provide emergency support to house operations (limited lighting, fridges, freezers) and enable occupants to survive extended power outages.

Energy and IAQ Monitoring Technologies

Net-energy zero houses constructed under our NZE program will be evaluated even after construction in order to validate their net-zero energy performance. The CNE wants to learn as much as it can from its housing projects to continually improve its housing program. The CNE will carry out extensive energy monitoring of each of the initial housing prototypes and a sampling of future NZE houses. Energy monitoring will include

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- blower door testing to confirm air tightness of the building envelope[6]
- detailed data collection over at least one year on energy production from the solar panels
- detailed monitoring of the energy used by occupants, after occupancy, throughout the house including
    - energy consumed by the air-source heat pump and the heat recovery ventilator (HRV)
    - household energy consumption for lighting, cooking, hot water and other uses

For the purposes of the energy monitoring activities to be carried out under its NZE program, the CNE has partnered with the Concordia University School of Engineering's Centre for Zero Energy Building Studies (Concordia). With the technical team, Concordia developed a monitoring protocol and programme and identified the equipment to be used. Measuring the performance of the NZE houses and confirming that they are performing at the net-zero energy standard is a significant component of the performance measurement aspect of our NZE program.

The technologies and equipment for this work are as follows

- Hygrothermal and indoor air quality monitoring equipment including
    - relative humidity and temperature sensors to measure humidity and temperature levels inside the building and its envelope
    - wood moisture content and temperature sensors to determine the moisture level of wood-based materials in the building envelope
    - carbon dioxide sensors to measure indoor air quality
    - a compact weather station to provide local micro-climatic conditions related to temperature, humidity, wind and solar radiation
- a blower door, thermographic camera and other equipment to measure airtightness and detect any perforations in the building envelope
- energy use and production monitoring equipment including
    - a PV energy generation logging device
    - end-use energy use monitoring systems subdivided into heating, ventilation, appliances, lighting and plug loads
    - HRV temperature and flow rate monitoring to determine the HRV efficiency and operation schedule
    - data loggers equipped with backup battery power

In addition to monitoring the performance of the houses, Concordia will carry out research activities on ways to enhance the energy performance of the NZE houses that includes

[6] The Cree Nation of Eastmain NZE program has adopted the "Passive House" airtightness standard (i.e. a minimum air tightness level of 0.6 air changes per hour (ACH) at 50 pascals) as it is considered by net-zero energy builders and energy modellers to be the most rigorous air tightness standard in the industry.

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- installing a building-integrated photovoltaic and thermal (BIPV/T) roof system that involves
  - integrating the photovoltaic system into the roofing material of the building envelope to minimize the amount of building material used and enhance aesthetics
  - using the cavity between the photovoltaic roof panels as a duct where outdoor air can be drawn and pre-heated for the HRV indoor air intake and monitoring the increased efficiency of the solar panels from the cooling of the panels
  - using the outdoor preheated air to preheat the ventilation air system
- using the insulated thermal mass of the crawl space for thermal storage
- evaluating the benefits of using an automated shading device on windows facing south, west and east as a way to reduce heat gains and the need for air conditioning in summer.

Monitoring equipment will be placed as follows.

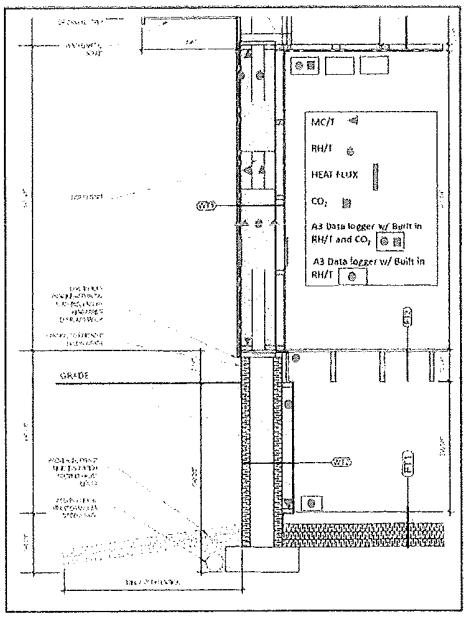
Table 17 – Monitoring Equipment Placement

Location	Equipment
Indoor	A3 wireless CO_2 data logger w/ integrated RH/T (4 resistance channels and 3 voltage channels)
	CO_2 sensor
	A2 wireless data logger w/ built in RH/T and MC
Wall	Point moisture measurement sensor
	RH/T sensor
Attic	A3 NEMA data logger w/ integrated RH/T (4V & 4R)
	RH/T sensor
	Point moisture measurement sensor
Crawl Space	A3 NEMA datalogger w/ integrated RH/T (4V & 4R)
	Point moisture measurement sensor
	RH/T sensor
System	I3 gateway interface
	Building intelligence gateway computer
Roof	Solar radiation sensor
	A2 Wireless Data Logger (with built in RH/T and MC
HRV	Air flow meter
	RTD temperature sensor
	RH/T Sensor
Energy	Watt-hour meter
Outdoors	Weather station

The below figure shows the location inside the house of the performance monitoring equipment.

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Figure 5. Wall section sensor layout.



Building System Assembly Technologies

Specific construction equipment and machinery will be used in the facility that will be constructed or rehabilitated by the CNE for the assembly of building components to be used in the new and the retrofitted NZE houses. This equipment includes

- carpentry and cabinet-making tools like cut-off saws, nails guns and drills
- air compressors
- A skyjack or boom truck
- a bridge crane

Approach to Future Proofing Technologies

All of the technologies being employed in our NZE program are standard and commercially available, selected on the basis of quality, energy performance, cost and simplicity of installation and maintenance. At some point, the equipment will need repair or replacement, however other than these normal foreseeable events, no other issues are anticipated.

The biggest technological challenge arises from the absence of any a local skilled electrical or HVAC tradespeople. This will make the installation and replacement of equipment, as well as routine maintenance and repair, very expensive. To address this issue, the CNE will focus on building capacity locally by training local tradespeople on the installation and maintenance of HRVs and air-source heat pumps. However, this is a long-term plan because HRV technicians must complete a 3-year apprenticeship.

Having chosen to use air-source heat pump technology, the CNE NZE program is vulnerable because it will have to rely on external technicians in the event of breakdowns. All houses are at risk of freezing in the event of heating system failure. However, given the low heat loss expected of the NZE houses and the inclusion of a backup wood heating appliance, these houses should be protected against freezing up and occupants will be able to remain comfortably in their homes until the heating system can be repaired.

Legislative Compliance

All applicable codes and standards were observed in the elaboration of the housing designs. The building system meets the structural requirements of the National Building Code of Canada (the "Code"), while dramatically surpassing the energy performance targets of the Code, and complies with other applicable federal and provincial legislation.

Gauging the net-zero energy performance was done using the HOT2000 software developed by Natural Resources Canada (NRCan) and a comparative modelling using the IES VE Energy modelling software. The CNE engaged skilled energy modellers and

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used accepted industry software to evaluate energy performance of the NZE houses and confirm that they will satisfy the net-zero energy targets.

The Government of Canada (GOC) is currently developing a "net-zero energy ready" model national building code as well as a model energy code for existing buildings. The CNE NZE program will satisfy the standards established in these codes and, in so doing, lay the groundwork for other Indigenous communities to create energy-efficient housing programs.

Development of Standards and Guidelines

The CNE intends to use the experience gained during its NZE housing program to create local standards and guidelines reflect the innovative combination of technologies, processes and systems that will facilitate the scalability and transferability of its program.

Interoperability of the Technologies

Several standards and guidelines were relied upon to develop the CNE NZE program and to design NZE houses under this program. The CNE has built on these standards and guidelines to create a program that reflects its reality and responds to its needs and capacities. The various standards and guidelines that the CNE referenced in designing its NZE program and the building systems have resulted in new combinations and interoperability between technologies.

HVAC Design

The design of the heating, ventilation and air-conditioning system (HVAC) for the Accessible House drew upon several standards. The air-source heat pump size was based on the HOT2000 load calculations. Heating and cooling loads will be met by a Fujitsu Halcyon Mini-Split Air Source Heat Pump. The sizing of the HRV and design of the duct system was established to meet CSA F326. Finally, rounding out the HVAC system, the CNE will integrate a high-performance, air-tight Droulet Blackcomb wood stove to provide a backup heat source.

Photovoltaic System

The photovoltaic array was calculated as part of the energy modelling exercise for the Accessible House and is based on the energy production requirements needed to meet the net-zero energy target. It was found that a photovoltaic array producing at least 14,309 watts is required for net-zero energy performance. The photovoltaic array will be made up of 45 panels, each with an output of 330 watts. Under Hydro-Quebec's "Net Metering Rate Option for Self-Generators", each of the NZE homes will be connected to the Hydro-Quebec grid and will use net metering. Under the scheme, the Hydro-Quebec grid will become the "storage system" for excess electricity produced by the photovoltaic system and "sold" to the grid. The amount of energy produced will be deducted from the amount used in calculating the household electricity bill.

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Accessible Design

The Accessible House features were designed to meet the accessibility requirements of the Code and applicable legislation. To create the Accessible House design the CNE drew upon the feedback received during community consultations, including caregivers and first responders. Guides and standards referenced in the design of the accessibility features of the Accessible House include the Canadian Standards Association "Accessible Design for the Built Environment" (CSA B651-12) and CMHC's "Accessible Housing Design Guides" (See Annex H).

Scalability and Replicability

The CNE NZE program is shown to be scalable. The designs and technologies are easily adaptable to respond to the different needs and capacities. The CNE has developed a scalable housing program that offers various sizes of housing to a variety of clientele.

The CNE plans to develop a guide setting out the processes for implementation of future net-zero energy initiatives that can be used as a framework by other Indigenous and non-Indigenous communities.

Technology Partners' Roles and Responsibilities

To design and develop its NZE program, the CNE built a team of skilled designers and technicians with extensive experience in the design, construction and evaluation of net-zero energy housing including

- **Bill Semple, NORdec Consulting and Design**
  Bill led the extensive community consultations carried out to gather input on the design of our NZE program housing prototypes and designed the Six-Plex, the Accessible House, the Cree Elders House, the Private Homeownership unit and the Starter House. Bill led the technical team that carried out the evaluation of the construction details, the net-zero energy modelling exercise, and the selection of all materials and equipment to be used in our NZE program. Bill developed the working drawings for the project and will assist in developing the capacity-building program for the NZE project.

- **Peter Amerongen**
  A leader in net-zero residential construction, Peter led the design of the building system and the net-zero energy evaluation. He identified and selected the materials and equipment required to achieve the net-zero energy and will help with the design of the capacity-building and training program for net-zero building techniques and the assembly facility.

- **Homesol Building Solutions**
  Homesol Building Solutions Inc. is an expert in green building and energy design consulting, energy modeling, ratings, labels and has verified building performance solutions for projects throughout North America. It was responsible for the energy modelling and evaluation of the net-zero energy status of the Six-Plex and the

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Accessible House. Homesol assisted in the development of the construction details and the selection of mechanical equipment.

- **Concordia University**
  Concordia University's Centre for Zero Building Studies is responsible for the energy monitoring program that will commence with the Accessible House and the NZE retrofit. This will include a breakdown of household energy use patterns including heating, cooling, hot water, appliances, monitoring energy production of the photovoltaic array, monitoring energy production of the air-source heat pump, and monitoring indoor air quality by tracking of CO_2 and humidity levels in the house (See Annex I).

- **McGill University**
  McGill University's Institute of Health and Social Policy will undertake a research project to develop and implement culturally-appropriate research methodologies for monitoring and assessing the results of the NZE housing program at every step. This will include studying the links between housing and individual, family and community well-being (See Annex J).

- **CMHC**
  Canada Mortgage and Housing Corporation provided financial support for the community engagement process and funding for the McGill University research project. In addition, has programs to support ongoing monitoring and evaluation of NZE houses as well as capacity-building. CMHC has acknowledged the importance of the social, financial and technical innovations of our NZE program and expressed interest in the research being carried out (See Annex K).

- **ReNu Engineering**
  ReNu Engineering is an Edmonton company specializing in building performance and energy efficiency. ReNu was responsible for conducting a comparative analysis of different HVAC options and developed the design and conceptual drafting of construction drawings for the selected HVAC system. ReNu also carried out a second energy modelling analysis on the Accessible House to confirm the net-zero energy target using the dynamic IES VE 3D building performance analysis software.

- **Cree Human Resources Development (CHRD)**
  CHRD has funding programs for capacity development that are available to the Cree Nation of Eastmain. CHRD has already contributed financially under its Youth Program that allowed three CNE youth to work with the Project Management Team. The CNE will continue to apply for CHRD funding throughout its NZE program.

ESDC?

Accessibility and Usability of the Technologies

The technologies employed in our NZE program will have a direct and indirect impact on the various stakeholders who will have access to the technologies and the data collected by these technologies.

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Builders and local tradespeople will be trained in net-zero energy building systems. By participating in the construction of NZE houses, builders and tradespeople will gain first-hand knowledge and net-zero experience. The repetitive application of the net-zero energy construction techniques should lead to a reduction in housing construction costs.

The HVAC Contractor will be introduced to the installation and use of air-source heat pumps and high efficiency HRVs. The air-source heat pump was selected because of its usability and ease of installation and maintenance.

Occupants will be introduced to and be given assistance on the use of the different technologies used in the NZE program. More particularly, occupants will learn to use programmable thermostats and smart home accessories to monitor home security, detect water leakage and track carbon monoxide levels, and online tracking of their energy consumption patterns and energy production through a dedicated website.

If occupants give their consent, the Housing Department may provide on-site support for remote monitoring carried out on the houses such as rebooting computers, changing batteries in the monitoring equipment as needed and mitigating risks. Furthermore, the Department may have access to monitoring equipment and data collected including energy monitoring data, production data and will have access to material cost breakdowns.

Identification of Risks

Data Security

To ensure data integrity, the NZE program data collection system will be able to operate as a stand-alone system to protect the security and integrity of the data without requiring third party analytics software.

There are measures that can be implemented to ensure data integrity and protect it from unauthorized access. Data collected will be communicated to a cloud-based server for analytics and will use a Secure Socket Layer (SSL) to maintain an encrypted link between the web server and browser. Custom access levels to the data can be given such as, read/write to authorized personnel and read only access for open data sharing.

CHAPTER 5: GOVERNANCE

Good governance practices and guidelines are essential to ensuring that government actions are fair and responsible and carried out in an open, transparent and accountable manner. The CNE adheres to good governance principles.

Governance Frameworks and Strategies

The CNE was a signatory to Canada's first modern-day treaty and a number of subsequent agreements reaffirming its right to self-government and to control its land and

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assets. These agreements together provide long-term predictability of funding to the Cree Nation of Eastmain.

Council is the local government authority and has responsibilities set out in the Agreement on Cree Nation Governance Between the Crees of Eeyou Istchee and the Government of Canada and the Constitution of the Crees of Eeyou Istchee, as well as under the Cree laws enacted pursuant to these instruments.

ISO/IMS

According to the World Bank, good governance "entails sound public sector management (efficiency, effectiveness and economy), accountability, exchange and free flow of information (transparency), and a legal framework for development (justice, respect for human rights and liberties).[7]" In accepting this definition of governance as one of the underpinnings of community success, the CNE has integrated the spirit of the Smart Cities Challenge. If the CNE promises to adhere to the principles of good governance, it must systematically govern itself. Its strategy, direction, and oversight will only be as effective and as functional as the management systems used to deploy them.

Its acknowledgment of the need for sustainable programs, capable of providing value to the community over time, incited the CNE to develop its ISO Integrated Management System (ISO/IMS) to manage the future growth and challenges of the community. The ISO/IMS provides clear direction and continuous feedback to decision-makers and sets a foundation for trust in the operations of the Cree Nation of Eastmain.

Cree Nation of Eastmain's Smart Cities Challenge governance approach is to integrate the NZE program into the design and development of its ISO/IMS in order to capture its ability to deliver reproducible quality outcomes with a measured degree of reliability. Lessons learned throughout the project, captured as best practices, will be systematically incorporated into NZE program documentation.

Because it is composed of system "modules", the ISO/IMS processes can all be captured and prioritized and implemented in a phased approach to help ensure the appropriate controls, such as transparency, privacy, and accessibility are in place as and when needed.

Through an iterative development approach that sets up the Smart Cities project processes to be executed, together with the capture of their relative performance for continuous improvement purposes, CNE will be developing a turn-key model of not only the housing solution itself, but also of the governance and management systems models that enable them to be sustained.

CNE's governance framework model employs the discipline and traceability of three distinct management systems:

[7] United Nations Economic and Social Council Committee of Experts on Public Administration Fifth session New York, 27-31 March 2006 Agenda item 5 —Compendium of basic terminology in governance and public administration E/C.16/2006/4 *Definition of basic concepts and terminologies in governance and public administration*

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- ISO 9001 Quality Management System (QMS) to ensure that CNE meets its community members' infrastructure needs as well as of the SCC solution itself
- ISO/IEC 20000-1 Service Management System (SMS) for the IT services supporting CNE and SCC
- ISO/IEC 27001 Information Security Management System (ISMS) for the protection and monitoring of CNE's information, data, privacy, security, and accessibility.

These systems are enabling CNE to plan, deliver, verify and improve on projects, programs and services. Under the ISO/IMS, the CNE is required to capture stakeholder needs and requirements when designing and developing of any new initiatives, like the Smart Cities Challenge, by using best practices and continuously seeking opportunities for improvement. As an audited, documentation-based system, the ISO/IMS will provide substantiated evidence of the project, from start to finish, making it packageable, transferable and reproducible.

Integrating an ISO/IMS into the SCC is not only novel and innovative in terms of its application of use in this context, but also in terms of its ability to enable CNE to capture and replicate this project to share with other communities. This unique approach will also enable an appropriate level of oversight over the SCC work processes to ensure success at every stage of its implementation. This level of risk management and pursuit of continuous improvement serves as a predictive indicator of failure-causing events, which in turn, makes them easier to avoid.

An investment into a systematic approach at capturing future value in best practices that have been developed within a local community can multiply the beneficial effect across other communities, with structure, discipline, accountability, transparency and quality housing.

Cree Laws and Policies

In this respect, the CNE must comply with the procedures set out in its financial and administrative laws with respect to expenditures and contracting. Budgets must be prepared by the Treasurer and approved by Council. Monies to be allocated to services and programs must be included in the budgets or supplementary budgets and approved by Council resolution. With the exception of borrowing for housing, long-term borrowing must be approved by Council and ratified by the electors of the Cree Nation of Eastmain.

Each year, the CNE is subject to audit of its financial statements. The auditors conduct an extensive examination of Council resolutions, contracts, purchase orders and payments to ensure that spending is done in compliance with the Cree law.

Activities under our NZE program that involve an expenditure of funds must use administrative and financial management tools that ensure the good financial management of resources. These tools include templated contracts, purchase orders, and budgets and financial statements on a project-by-project basis.

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Project Management

Under our NZE housing program, Council and the Project Management Team will review program needs and make decisions on project funding on an annual basis and as needed to respond to program requirements. The Project Management Team will have an obligation to report to Council and to the members on the use of Cree Nation of Eastmain's NZE program contributions. All such reporting will be done at public meetings to ensure the transparency of the NZE program activities and enhance the accountability of the Cree Nation of Eastmain.

Our NZE program governance framework will be made up of a two-tier project management system. One tier will manage the NZE program and provide technical support, the other will manage project construction activities and costs. The purpose of this structure is to minimize risks and improve chances of success. All construction projects will be supported by a team of experts making sure that construction can be completed on time and on budget.

The Project Management Team will be responsible for

- obtaining funding for the NZE program and construction activities
- carrying out all design review and changes
- evaluating and approving all change orders
- overseeing all aspects of the NZE program.
- evaluating the project to ensure compliance with building code and other standards
- tracking all materials, orders and costs as well as labour costs
- developing the capacity-building program and overseeing its implementation

The construction project manager will be responsible for

- tendering and contracting with contractors
- establishing and undertaking a material inventory control system
- undertaking the assembly of building components to avoid seasonal impacts
- ensuring construction projects are started and completed on time
- monitoring contract performance
- providing proper site supervision
- controlling costs

Partners and Resource, Capacity, Roles and Readiness

The CNE will work closely with its partners Concordia University, McGill University, Renu Engineering, Canada Mortgage and Housing Corporation (CMHC) and Cree Human Resources and Development. The partners' roles in our NZE program is determined by their respective sphere of activity and expertise. Each of our partners has the capacity needed to contribute to the success of our NZE program.

Concordia University will carry out all the quantitative data collection as well as the storage and protection of this data. McGill University (McGill) will collect qualitative data relating to occupant experience and will also be responsible for the storage and protection of this data. McGill will ensure that data it collects under our NZE program is anonymized prior to disclosure to our program partners or any third party

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CMHC has approved a three-year project for the CNE McGill to carry out qualitative research on the occupants and resident's response to the NZE houses and NZE retrofits. The Contribution Agreement has been approved in principle with wording relating to intellectual property rights and privacy to be finalized.

Concordia University

Concordia University Department of Civil and Environmental Engineering's Centre for Zero Energy Building Studies (Concordia), is one of the leading research institutes on net-zero energy buildings in Canada. Dr. Andreas Athienitis, Director of the Centre and Scientific Director of the Natural Sciences and Engineering Research Council of Canada (NSERC) Smart Net-Zero Energy Buildings Strategic Network, is known at home and abroad for his work promoting net-zero energy buildings. His extensive work in this area has enabled Concordia to build significant capacity in this field, with several professors and graduate students specializing in net-zero energy and solar buildings. Concordia will carry out extensive field monitoring of the houses built under the CNE NZE program which will serve as a model for a framework that can be replicated in other northern communities. Field testing will be carried out by Concordia graduate students, supported by Dr. Athienitis and Dr. Hua Ge.

McGill University

Qualitative research on our NZE project will be carried out by the McGill Department of Geography Institute for Health and Social Policy's Place, Health and Well-being Research Group. Led by Dr. Mylene Riva, Assistant Professor at the Institute and the Department, the research group will examine the social and environmental determinants of health and well-being among Indigenous and non-Indigenous peoples. The extensive field research to be carried out in Eastmain, will build upon a previous project carried out in Nunavik on Housing, Health and Well-being in the Artic. The research activities will be undertaken by graduate students from the Department under the supervision of Dr. Riva. The research work will examine the links between housing and individual, family and community well-being.

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Figure 6. RACI Matrix

Project Deliverables	Council	Project Management Team			External Resources						
		CNE	NORdec Consulting	Ashini Consultants	Concordia University	McGill University	General Contractor	Renu Engineering	CMHC	CHRD	Training Institutions
Net Zero Housing Program Strategy	I	A/R	C						C	C	
Net Zero Housing Program Design	I	A/R	C	C	C	C	C	C	C	C	C
Net Zero Housing Program Implementation	I	A/R	C	R/C	R	R	R	R	I	I	I
Net Zero Housing Program Change Management	I	A/R	C	C	C	C	C	C			
Project Charter	A/R	C/I									
Acquisition of financial resources	I	A/R							C	C	
Funding approvals	A/R	C									
Housing unit design review and changes	I	A	R	R	I	I					
Financial Management	I	A/R					R				
Quality Management		A/R	C	C			I				
Supplier /Contract Management	I	A/R					R				
Risk Management	I/C	A/R	R	R	R	R	R	R			
Ensuring that all standards and applicable codes are followed		A/R					R				
Project change orders		A/R	C	C			I				
Project oversight		A/R	R	R							
Resource control for Pilot		I	C	A/R							
Material negotiations		A/R		R							
Capacity building and training		A				R	R	R	C	C	R
Tendering and issuing of contracts							A/R				
Hiring of trades and subtrades		I	I	I			A/R				
Site supervision							A/R				
Construction cost control		I	I	I			A/R				
Material Inventory Control		A/R	C	C							
Assembly of building components		C	C	C			A/R				
Collection and monitoring of qualitative data		I	C	I		A/R					
Collection and monitoring of quantative data		I	I	I	A/R						
Protection & privacy of quantitative data	R	R	R	R	A/R						
Protection & privacy of qualitative data	R	R	R	R		A/R					
Approval for public release of information	A/R	C									

Control over Sensitive and Personal Data

The CNE and its partners are all responsible for compliance with data protection and privacy obligations.

Data collected in the context of our NZE program will remain the intellectual property of the Cree Nation of Eastmain. The public disclosure of any such information requires the Cree Nation of Eastmain's prior consent.

Any disclosure of information collected under the auspices of our NZE program must first be anonymized and all personal identifying information removed. The CNE intends to enter into memoranda of understanding with its partners, and other person involved in our NZE program, to ensure compliance with the Personal Information Protection and Electronic Documents Act (PIPEDA).

Risk Management

Below are some of the risks relating to governance that have been identified along with the steps take to avoid these risks or to remedy them.

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Table 18 – Risk Identification, Prevention and Correction

Risks	Preventive Measures	Corrective Measures
Changes in Council priorities that negatively impact funding commitments for NZE program	Keep Council informed of benefits of NZE program and its importance	Seek additional investment and financing.
Changes to government policies		Adjust the project according
Contract disputes	Ensure effective supplier/contract management is in place	Bring the interested parties together to mediate a solution
Partner withdrawal from the program	▪ Good leadership ▪ Healthy communications to identify issues early ▪ Effective engagement	Establish new partnerships

CHAPTER 6: COMMUNITY ENGAGEMENT

Approach to Engagement

In order to enhance the success of its Housing programs, the CNE is working toward increasing the residents' understanding of its Housing Policies and programs so that they can fully take advantage of these. The Housing Policies are currently being reviewed and during this process, ongoing discussions, information sessions and workshops will be used to educate and gather input from residents on these policies. Community engagement has always been the preferred method for the Housing Department to obtain feedback and ideas from Eastmain residents. Key strategies that we have used to support the Cree Nation of Eastmain's efforts to inform and educate residents include

- developing a Tenant Guide Booklet to be provided to every household
- holding information sessions and workshops for community members on Home Ownership and Tenant Responsibility
- doing monthly Radio Talk Shows on Housing matters
- organizing CMHC-sponsored workshops for tenants and maintenance workers on mould issues, indoor air quality, basic home maintenance, and Section 95 Housing.

Cree Nation of Eastmain's Sustainable City Challenge Statement, "Improving Community Well-Being", evolved from a series of meetings between Chief and Council and the CNE Housing Committee, and numerous informal and formal discussions with elders and other residents. During this engagement process, the CNE became acutely aware of the ongoing issues that residents have with housing designs, construction standards and the operations of mechanical systems. As such, broader consultation was carried out on these issues at community meetings, design workshops and home visits. Community events included

- Workshops/Charrettes (2017 and 2018)
- Annual General Assemblies/Cree Café (2017 and 2018)

pre-plant

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- Meetings/consultations with users (tenants and occupants), and professionals (caregivers, first time responders etc.)
- Special Events
  - Housing Forum (2018)
  - Builders Forum (2018)

Consultations, home visits and workshops were held in June 2017 with the focus of gathering residents' ideas on the design of various housing prototypes. This initial consultation process was followed up by workshops in January 2018 where preliminary plans for the Cree Elders House, the Starter House and the Six-Plex were presented, and residents were invited to comment on these. Consultation was held in the summer of 2018 on the design of the Accessible House.

Annual General Assemblies

The CNE holds regular Annual General Assemblies (AGAs) to receive members' ideas such as topics on ways for improving housing in the community. Break-out groups during the AGAs allow smaller focus groups to explore questions in greater depth.

At the 2017 meeting, the Housing Department presented designs for a Cree Elders' House (Annex L), an Elders' Community (Annex M) and a Starter House (Annex N). A housing booth was set up so members could review the preliminary plans, ask questions and comment on the house designs. The CNE received positive feedback on the designs. Members also expressed their desire to see more durable and energy-efficient homes built in the community. The incorporation of culturally-appropriate features, the installation of solar panels and the use of thicker, better insulated walls were a starting point for further discussions around making houses more sustainable.

this was evident in ch. 1 & 2

CNE Housing Forum

In February 2018, as a continuation of the community engagement process, a Housing Forum, with a focus on obtaining members' input on CNE housing needs and the Smart City Challenge, was held. The Housing Forum was devised to enable the sharing of information and gather members' input on the Smart Cities Challenge, the Cree Nation of Eastmain's proposal to create an NZE Housing Program and the preliminary design for a culturally-appropriate NZE Six-Plex.

[redacted]

Reflecting a trend that is emerging in many northern Indigenous communities, multi-unit housing is being promoted as a means to reduce land development and construction costs, improve energy efficiency and enhance the sustainability of the community. The Housing Forum gave members information and a chance to exchange ideas on

- the Smart Cities Challenge
- the proposed NZE housing program
- energy efficiency targets, technologies and the building systems used to reach these targets

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- lessons learned from other successful NZE projects in Canada
- the challenges facing remote northern communities in attaining NZE targets and their relationship to the traditional lifestyles
- housing design ideas and principles with respect to the proposed culturally-appropriate Six-Plex
- community resiliency and the impact NZE housing can have
- the importance of capacity-building and training to create a sustainable housing program
- the cost/benefit of an NZE program for the Cree Nation of Eastmain
- smart home technologies
- housing maintenance
- views of local builders on NZE building systems

After significant discussion, the CNE members adopted a Resolution supporting CNE's participation in the Smart Cities Challenge. (Annex O) This included the implementation of an NZE Housing Program and the construction of an NZE Six-Plex (Annex P). After the Resolution was adopted, community members were divided into four discussion groups where they provided more detailed input on the Smart City Challenge and the CNE NZE Housing Program.

Cree Cafes and Targeted Consultation

The ongoing use of the Cree Cafés during AGAs and community meetings has led to design innovations and gives residents a means to voice their ideas and share their experiences in respect of housing. It was through this process that the net-zero housing initiative was developed. Input was also sought from service providers in the health care and public safety sectors and, with the ideas of residents, informed the development of several culturally-appropriate housing designs that reflect on the Cree way of life.

Cree Café focus groups broke out during the Housing Forum to discuss questions related directly to the Cree Nation of Eastmain's development of the Smart Cities Challenge proposal. The discussions at the Cree Café confirmed strong support for a net-zero energy housing program, improvement of housing design, durability and operating cost. In particular, there was significant support for

- more design options for homes that will give residents greater opportunity to participate in housing design and that meet the needs of different members
- exploring pre-fab construction that would give the CNE more control over the quality of construction and lead to the creation of more local employment
- home monitoring to help protect homes against break-ins and equipment breakdowns when members are out on the land or travel down south.

The CNE recognized early on during the Smart Cities Challenge community engagement process, that engaging with local builders, to get their input and support, was essential to the success of the project. As part this process, an initial consultation session was

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facilitated by design and technical consultant, William Semple, and net-zero energy consultant, Peter Amerongen, in October 2018. The presentation made to local builders during this consultation session provided information on house designs, the proposed building system, costing, capacity-building issues and the targets for the project. Local builder consultation sessions were used to gather feedback and initial impressions of the NZE program and the challenges and opportunities it would present.

Builders' Forum

Building on the first local builder consultations, an Eastmain Builders' Forum was held in December 2018. The Forum brought together local builders and tradespeople, housing inspectors and representatives from the construction materials supply chain with a view to ensuring the comprehensive representation of the building industry on the NZE program. The CNE took the opportunity to affirm the importance of the participation of local builders and suppliers to the success of the NZE program. More particularly, they were informed that a collaborative and cooperative approach must be taken if the NZE program is to address the ongoing issues with residential construction costs in Eastmain. This further reflected the CNE view that success and sustainability of its NZE program required a holistic approach and the buy-in of all stakeholders.

The Builders' Forum included an overview of the Smart Cities Challenge and the Cree Nation of Eastmain's proposal to establish a net-zero energy housing program to respond to its housing shortage. Participants were presented with the house designs and the proposed building system and technologies.

Builders and industry representatives in attendance expressed strong support for the NZE program and its goals of constructing more, better-built and resilient housing, creating employment and economic development opportunities and building housing industry capacity in Eastmain.

Eastmain Partners Meeting – Concordia University

In January 2019, the CNE and its partners and interested government agencies participated in a two-day meeting and planning session at Concordia University. In attendance were potential funding agencies, research partners and the CNE Smart Cities Challenge team. Presentations included

- CMHC northern housing research projects
- NRC northern research projects
- McGill University social northern housing research in Nunavik
- Concordia University Centre for Zero Energy Building Studies research projects and the NSERC research network

The session also

- developed linkages between the social and technical researchers and research projects

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- provided an overview on the Eastmain Smart Cities Challenge proposal and long-term objectives of the community
- provided an opportunity to contribute to the development of the research objectives of the research partners and input into the development of the final proposal

Community Engagement Plan – Project Implementation

As part of its ongoing consultation process with its members and to support the Smart Cities Challenge initiative, the CNE will carry out ongoing consultation with members and other stakeholders. In addition, the CNE will share NZE program progress and outcomes, and continue to obtain feedback from residents on the NZE program, including the important cultural aspects addressed in the design of the houses. The Cree Nation of Eastmain, in partnership with its research partners, will launch initiatives to gauge the impressions of residents living in NZE houses, with respect to their designs, and the roll out of the construction of NZE housing in the community.

culturally appropriate CHR

To ensure that Indigenous values, traditions and experiences guide the research, the research project will be conducted according to the principles of Indigenous Research Methodologies (IRM), using research methods for community-based participatory research (CBPR) to engage with Eastmain residents. Using the participatory research model, the McGill University research team will work in collaboration with the CNE. The partners will contribute to the various phases of the research, especially in defining the research questions and objectives, developing the methodologies, data collection and analytical processes, and disseminating the research results. Participatory research will include validation steps at every stage of the NZE program.

For this research to be culturally-sound and grounded in Cree lived-experience, it will engage with Cree worldviews, knowledge and idioms, with a focus on the central role that relationships play in Cree culture. The McGill University research team will conduct one-day workshops with groups of 6 to 12 participants, ensuring representative demographic groups that include women, men, elders and youth. Following the IRM principles, talking circles will be used as a culturally-appropriate way to exchange ideas and bring together varied perspectives on complex subjects. Talking circles will allow the McGill University research team to obtain a comprehensive understanding of the Cree perspective of relationships and how these are impacted by housing conditions and design, and how these housing conditions and designs impact individual, family and community health and well-being.

The IRM principles will guide the research aspect of the NZE program, and data collection methods will be carried out in collaboration with the CNE. The research project will document

- housing conditions and well-being of individuals, families and of the community at "baseline"; i.e. before the implementation of the NZE housing program
- the change in housing conditions, after the implementation of the NZE housing program (i.e. impact assessment of the NZE housing program)

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- the impacts on occupants arising from the change in tenancy and occupancy of a new NZE home or NZE retrofitted unit
- culturally-appropriate and NZE design vs. housing presently available
- NZE retrofitting houses vs. moving into a newly-built house, vs. moving into an existing house in the community made available when other residents move into private homeownership houses

Eastmain Community Housing Meeting (May 2019)

Once the winners of the Smart Cities Challenge is announced and prior to launching the NZE housing program, the CNE will hold a special community meeting and information session. The meeting will provide information on the proposed roll-out of the NZE program including

- a detailed overview of the Cree Nation of Eastmain's final proposal for the Smart Cities Challenge
- the final designs of the houses to be constructed under the NZE program
- a detailed overview of the NZE construction projects to be carried out in 2019
- the proposal respecting the establishment of a warehouse/building component assembly facility
- the project management plan and the proposed timelines for the NZE program

Eastmain Annual General Assembly (August 2019)

At its 2019 AGA, the CNE will provide an update on the results of the Smart Cities Challenge and the roll-out of NZE housing program. A presentation of final drawings and 3-D models of the Accessible House being constructed at the time of the meeting, and the Six-Plex to be constructed in 2020. The information on these construction projects will include (a) the building system, (b) the plans for local assembly of building components, and (c) the net-zero energy monitoring of the projects. The AGA will serve to collect members' feedback on

- proposed project roll-out and construction timelines
- capacity-building and training components and their impacts on local employment
- proposed project monitoring and data collection

Builders Meeting/Workshop (Autumn 2019)

A one-day interactive workshop will be held late in Autumn 2019, after the completion of the Accessible House. The session will include those builders and tradespeople that worked on the Accessible House project. The workshop will consider and make recommendations on

- building system costs, ease of construction, changes or alterations
- pre-assembly of the wall system

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- integration of the trades into the production of the house
- evaluation of the material ordering/storage
- capacity-building and training

Eastmain Community Housing Forum (Autumn 2020)

A one-day Housing Forum will be held in Autumn 2020, after construction has commenced on the first Six-Plex project. The Forum will allow the CNE to get members' impressions on the design of the NZE houses, share results of year-1 monitoring and inform them of the progress of the warehousing and building component assembly facility.

The extensive community engagement initiatives that the CNE has taken on with the NZE program are reflective of the community's ongoing commitment to engage and consult with its residents on important community issues like housing. While the CNE's aspiration to combine the construction of multi-unit homes with NZE performance, culturally-appropriate designs and features is unique and ambitious, the CNE believes the project is achievable – and that extensive community involvement in the project is an important component in ensuring its success.

CHAPTER 7: DATA AND PRIVACY

Preliminary Privacy Impact Assessment

The CNE prepared a Preliminary Privacy Impact Assessment (PIA) showing the consideration it gave to the collection, use and flow of information (See Annex Q). The PIA was sent to the Office of the Privacy Commissioner of Canada for comments. These comments[8] have been considered in the elaboration of the Cree Nation of Eastmain's activities that touch data protection and privacy.

Compliance of Data Management Plan with PIPEDA

Privacy and the NZE Program

The NZE housing program will involve the collection, use and retention of personal information, of varying degrees of sensitivity. The information collected includes inter alia the below information (Table 19)

[8] The comments are attached together with Annex R.

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Table 19 – Information Collection and Purposes

Information	Purpose
Name	Identification
Family Size	Allocation of appropriate housing
Address	Identification
Total household income	Determine rent
Health conditions (if any)	Determine special housing needs
Rental arrears	Determine eligibility for new housing and/or subsidies
Loan information	Confirm ability to pay and eligibility under Private Homeownership Program
Credit rating	Verify capacity to pay rent

In collecting this information, the CNE intends to comply with fair information principles.

Pursuant to the Agreement on Cree Nation Governance Between the Crees of Eeyou Istchee and the Government of Canada and the Constitution of the Cree Nation of Eeyou Istchee, the CNE must establish access to information procedures with respect to information in its control. The CNE is implementing a process for classifying information and establishing the level of protection required.

Presently, CNE agreements with suppliers, contractors and consultants contain provisions respecting confidentiality and, with respect to service providers, retention and disclosure restrictions.

With respect to the NZE housing program, both Concordia University and McGill University[9] are subject to their own privacy policies and to the Quebec Act respecting access to documents held by public bodies and the protection of personal information, CQLR ch A-2.1. Concordia University's Office of Research will provide guidance to the CNE to ensure research conducted under our NZE program complies with all applicable legislation and policies. A Summary Protocol Form will be submitted to the Concordia University Human Research Ethics Committee (UHREC) to obtain a Certificate of Ethical Acceptability before undertaking any monitoring of any occupied houses. Annual progress reports will be submitted to UHREC to obtain approval of the research privacy and data protection protocols throughout the monitoring phase.

A consent form that contains a plain language description of the project and any possible privacy risks will be given to occupants as part of the consent process.

Methods of Data Collection, Analysis and Storage

The CNE has held public meetings with its members to design the NZE housing program. As well, housing continues to be tabled at public meetings. Members are informed regularly of the information requirements for housing in general, which includes much of the information set out in Table 19.

[9] McGill University is subject to the Tri-Council policy Tri council policy statement http://www.pre.ethics.gc.ca/eng/policy-politique/initiatives/tcps2-eptc2/chapter9-chapitre9/

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New regional policies will be coming into force and the NZE housing program will involve further consultation with members to ensure comprehension of the additional information requirements of the regional policies. The CNE will also inform members of the type of information that will be required and the purpose of collection of information under the NZE program. Prior to the collection of information, the individual is informed of the reasons for which the information is collected, how it will be used and whether it will be shared with other organizations.

Table 20 – Non-personal Information Collection and Purposes under NZE Program Monitoring

Information	Purpose
House Model/Size	Research
Energy use	Research
Air quality	Research
Comfort	Research
Satisfaction	Research

Collection

The CNE Housing Administrator will collect only that information required for the purposes of administering the NZE housing program and complying with the CNE housing policies and the policies to be adopted by the Cree Nation Government. More specifically, the CNE must, in order to administer its NZE program, be able to identify the occupants, verify their eligibility under the programs and capacity to pay and understand the health conditions, if any, that may be determinative on the type of housing unit allocated to the occupants.

The information collected by Concordia University and McGill University is necessary to enable the analysis of the net-zero energy technologies, construction systems and to measure the success and individual satisfaction with the NZE homes to be built in Eastmain.

Use, Disclosure and Retention

The information collected by the CNE will be used exclusively for the purposes of administering its housing program; i.e. allocating housing units, fixing the rent to be paid and establishing maintenance schedules, amongst others. Information collected by Concordia University and McGill University will be used solely for research purposes.

The information collected by the CNE will not be disclosed to third parties except as required by policy. Disclosure to the Cree Nation Government may be required under CNG policies and funding arrangements with the CNE, so that the occupant or the CNE can access subsidies for housing. Otherwise, the CNE will not disclose information collected from members for the administration of its program to third parties.

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The CNE will however collect information generated by the sensors and data loggers. This information will be anonymized and then transmitted to Concordia University for the purposes of monitoring the performance of the NZE houses. McGill University will be responsible for collecting information directly from occupants of NZE houses and Eastmain residents with respect to the qualitative study it will conduct.

The information collected under this study will not be disclosed to third parties, including Cree Nation of Eastmain, until it has been anonymized.

Depending on the housing program, and the type of information collected, information collected for the purposes of administering the housing program is held for the duration of the housing project (i.e. until final payment) or until it is no longer relevant (such as a change of occupant).

McGill University may retain information for up to 20 years under its policies. This information though will be in an anonymized format.

Security and Privacy Considerations

The CNE is implementing information and data management protocols to ensure that personal and confidential information are properly collected, managed and stored. Given the feedback from the Office of the Privacy Commissioner, the CNE will require partners to enter into agreements that provide for the protection of personal and non-personal confidential information.

Adherence to Fair Information Principles

Governance

The CNE is committed to ensuring that personal and confidential information collected under its NZE program is treated in compliance with the Personal Information Protection and Electronic Documents Act. The CNE is implementing an Integrated Management System auditable to ISO Standards; 9001:2015 Quality Management; 20000-1:2011 Information Technology Service Management; and 27001:2013 Information Security Management.

It is also noteworthy that developing a privacy and data protection policy is a priority of the CNE. Recognizing the vast amounts of personal, employee, business and confidential information it handles regularly, the CNE plans to ensure that information is properly classified. Classification of the information it collects, uses and processes will ensure that, through policies, the CNE can establish the appropriate protection of that information and define access and disclosure restrictions.

Ownership and Control

Personal information required under its housing program will be owned and controlled by the CNE. In fact, where third party services are required to process the information, the CNE standard contracts contain clauses ensuring that any information obtained or

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processed by the third party remains the property of the CNE. More importantly, the information cannot be accessed directly by the third party on the CNE information system without first obtaining the necessary authorizations. The authorization is given in the form of a letter that must set out the purpose of the access and the period of access.

In the NZE program, the CNE will also retain ownership and control of the data generated by the sensors and data loggers installed in NZE homes for monitoring purposes.

Consent

The CNE collects and holds information relating to members under other programs, including member benefits and elections. However, there is no information sharing between departments and programs unless the member expressly consents to disclosure of this information.

The name and address of occupants as well as information relating to membership are generally publicly known given the size of Eastmain. While the CNE may have a general understanding of certain health conditions, this information must be obtained directly from the individual or, if incapable, from that individual's caregiver with express consent.

Under the NZE program, CNE will only collect information from occupants of NZE houses or NZE retrofits, as required by the regional and CNE housing policies. This involves collecting personally-identifying information and information relating to occupants' financial situation directly from occupants. Prior to collecting this information, the CNE will ask occupants to consent to the collection of their personal information, using a consent form developed for the Housing Department needs. Pursuant to CNE practices, occupants must also consent specifically to the further sharing of information.

Occupants of NZE houses and NZE retrofits will also be asked to consent, on a voluntary basis, to the collection of information generated by the sensors and data loggers installed in the NZE houses and retrofits and will be told the purpose of such collection. Consent must be given in writing and will be related solely to the research conducted by Concordia University. The information will include addresses and other personally-identifying information collected by the CNE.

Concordia University will also request the consent of occupants participating in the NZE program monitoring. The consent form will explain in plain language that consent is given on a voluntary basis, with the option to withdraw at any time.

McGill University will collect information through one-on-one interviews, surveys and questionnaires. Occupants of NZE houses will be given a questionnaire each year. All collection and use of the data obtained through these methodologies will be subject to the consent of the occupant and McGill University must pass all research by the Ethics Committee to ensure that it conforms to McGill University's policy on protection and retention of personal information[10].

[10] *Ibid.*

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Data Minimization and De-identification

Information relating to energy use and production is non-personal information generated by the sensors and data loggers installed in NZE homes and retrofits and will be collected by the CNE Housing Department. The information will include the addresses of the homes, but this information will be removed before transmission of the non-personal energy use information. The CNE will anonymize all information before it is transmitted to Concordia University for the purposes of its study.

Access

Because personal information is collected for the purposes of administering the NZE housing program, it is important that it be accurate and up-to-date. Under CNE policies personal financial information must be updated every two years to ensure its accuracy. Individuals may also periodically update or modify their information by making a request to the Housing Department.

Under the Constitution of the Cree Nation of Eeyou Istchee, the CNE must set up a process to respond to access to information requests. This will include identifying the person who will respond to such requests. Presently, members attend the CNE administration offices to request access to information and documents held by the CNE.

Individuals may access information pertaining to them to ensure its accuracy and make corrections. Generally, this is done directly with the department holding the information.

Security

The information held by the Housing Department is kept in locked cabinets and password-protected computers to ensure information is adequately protected and can only be accessed by those administering the housing programs.

The CNE is sensitive to the need to protect the privacy of residents. By classifying information and setting access rights accordingly, it will restrict access to personal information it receives from occupants under its housing programs.

All information collected by McGill University will be anonymized. The names of study participants will be kept in separate password-protected files. Each participant will be attributed a number to prevent their identification. McGill University is alive to the risk that some participants will be readily identifiable solely on the basis of their comments or responses and will look for ways to mitigate. All information is kept in a password-protected computer in a research lab that can only be accessed with a code.

The NZE houses will be equipped with connective technology allowing Concordia University to monitor and measure field data and performance data. The data generated through the monitoring equipment will be sent by the CNE to Concordia University using Secure Socket Layer (SSL). This will ensure an encrypted link is maintained between the web server and browser and prevent cybersecurity breaches that would put the data at risk of unauthorized access or unintentional disclosure.

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Open Data Strategies

The CNE has embraced an open, transparent data strategy aimed at ensuring ongoing communications with Eastmain residents on the NZE program. The level of consultation and community engagement has been extremely high and will continue under the NZE program.

Open data strategies will ensure that Eastmain residents have access to the results of the studies being conducted by Concordia University and McGill University.

Through smart technologies installed in NZE houses, occupants will have access to information relating to their energy use and production, energy use patterns and indoor air quality of their houses. These technologies are commercially available which means that they are easily transferable and reproducible in other projects and communities.

Risks

Table 21 – Risk Analysis

Risks	Preventive Measures	Corrective Measures
Accidental/intentional disclosure of personal information	Keep hard copy information in a secure, locked location Password protect computers and computer files	Inform occupants of breach Impose secure storage and password protection protocols
Identification of occupant from responses to McGill questionnaire	Phrase responses to avoid identification Explain to respondents the risk of identification	Remove response from published study
Accidental/intentional disclosure of health information	Keep hard copy information in a secure, locked location Password protect computers and computer files	Inform occupants of breach Impose secure storage and password protection protocols
Accidental/intentional disclosure of financial information	Keep hard copy information in a secure, locked location Password protect computers and computer files	Inform occupants of breach Impose secure storage and password protection protocols
Decision-making based on out-dated or inaccurate information	Ensure information is updated regularly Ask occupants to provide updated information	Correct information

CHAPTER 8: FINANCIALS

The CNE has extensive experience in managing capital projects, from securing funding and managing costs, to completion of various multi-million-dollar projects undertaken over the last ten years. Projects included construction of public facilities, infrastructure and housing. CNE benefits from some of the most up-to-date technologies to manage its projects including GIS, Accounting and Cost Control Systems, Preventive Maintenance, Project Management and Document Management Systems, that are linked together to improve efficiency. Our IT systems will soon be updated to a hyper-converged infrastructure that permits multiple servers to act as one which improves scalability, data protection, management, maintenance and operational activities.

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As a Cree local government, the CNE is required to follow the Canadian public sector accounting standards prescribed for governments as recommended by the Public Sector Accounting Board of the CPA Canada with exceptions of certain requirements as agreed by Canada and as detailed in our annual Independent Auditors Report. CNE management is responsible for the integrity and objectivity of financial statements and for implementing and maintaining a system of internal controls to provide reasonable assurance that reliable financial information is produced. CNE's Council is responsible for ensuring that management fulfills its responsibilities for financial reporting and internal controls and is ultimately responsible for reviewing and approving the financial statements.

Local companies in Eastmain, working with external skilled tradespeople for plumbing, electrical, heating and ventilation, will be constructing and retrofitting the NZE units. The CNE will be responsible for securing all funding and issuing contracts to Stajune Construction for project management and cost control of the construction works on a fixed-cost basis throughout the program. The CNE will also be responsible for monitoring the overall NZE program, risk management, the purchasing and negotiating with suppliers for all construction materials and the control of inventory.

Project Budget

Funding for the CNE NZE program has been secured, with the exception of the Smart City Challenge winner's prize, and revenues generated from the sale and leasing of housing units. The CNE will continue to apply under any funding programs that can benefit the NZE program.

Revenues

Details of our secured and projected revenue sources are as follows

- **Cree Nation of Eastmain**
  The CNE will contribute up to $5M from its Local Economic Development Fund over a six-year period for the NZE program activities, matching the SSC prize if CNE is chosen as the winner
- **Infrastructure Fund**
  Funding comes from an annual subsidy provided to the CNE through the regional government for housing and infrastructure purposes
- **Housing Action Plan**
  These funds are received from the regional government for urgent mould remediation and housing renovations
- **Regular Program Subsidies**
  Grants from the regional government help off-set the high costs of construction in Eeyou Istchee
- **Smart City Challenge**
  The prize awarded to the winner of the Smart Cities Challenge $5M category

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- **Sales and Rent**
  The monies received from the sales of the NZE private homeownership houses and the monthly rent collected from tenants occupying rental housing units
- **Training and Development**
  Revenues secured by the CNE to date from outside sources that have programs designed to build capacity in Indigenous communities

Expenses

Expenses for our NZE program are costed in today's dollars and exclude possible year-to-year inflationary increases that would normally apply to construction labour and materials. The CNE believes that as it gains experience in net-zero building techniques, efficiencies will off-set annual inflation numbers. Also, costing for material was based on northern norms and excludes potential savings that may be generated by bulk ordering materials and establishing and improving CNE's supplier management processes and the relationships within the supply chain.

CNE NZE program projected expenses are

- **Accessible Housing Unit**
  Construction costs for building an Accessible House pilot unit in year-1 of the NZE program
- **Multi-Client Six Plex**
  Construction costs for building 5 Six-Plex buildings over a five-year period between year-2 and year-6 of the program
- **Detached Single Family Unit**
  Construction costs for building 4 single-family houses in year-2 through year-5 of the NZE program (this excludes the pilot Accessible House). Year-2 and year-4 will see a 2-bedroom Starter House built and a 3-bedroom Private Homeownership House will be built in year-3 and an Elders House built in year 5
- **NZE Retrofit**
  Expenses are related to carrying out a net-zero retrofit pilot in year-1 and retrofitting 4 units in year-2, and 5 retrofits each year for years 3 to 6
- **Training and Development**
  These expenses represent the estimated costs for training and work experience programs for construction workers in relation to net-zero building and potential CNE contributions to qualify community members in the skilled trades of plumbing, electrical, heating and ventilation
- **Program Administration**
  These expenses are related to CNE project oversight and personnel required to ensure overall success through continuous program marketing, operational support by technical experts, professionals and applying for additional resources to extend projects beyond the Smart Cities Challenge
- **Solar Technologies**
  The Cost "B" estimate for the Accessible House, based on the energy modeling exercise used to determine the size of the photovoltaic array needed to produce

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the electricity requirements to reach net-zero status. This number was used to determine the average number of photovoltaic panels per unit being built and retrofitted per year.

SMART CITY CHALLENGE----Net Zero Energy Housing Program

Proforma Financial Statements

	Year Ended 31-Mar-20 Proforma $	Year Ended 31-Mar-21 Proforma $	Year Ended 31-Mar-22 Proforma $	Year Ended 31-Mar-23 Proforma $	Year Ended 31-Mar-24 Proforma $	Year Ended 31-Mar-25 Proforma $	Totals $
Revenue:							
Cree Nation of Eastmain	100,000	900,000	1,000,000	1,000,000	1,000,000	1,000,000	5,000,000
Infrastructure Fund	147,912	20,112	20,112	20,112	20,112	20,112	248,472
Housing Action Plan	196,790	196,790	196,790	196,790	196,790	196,790	1,180,740
Regular Program Subsidies	127,800	633,200	674,600	633,200	544,800	544,800	3,158,400
SMART Cities Challenge winner's prize	517,285	1,160,551	1,225,331	1,063,633	1,033,200	-	5,000,000
Sales and Rent	3,000	871,956	871,956	871,956	871,956	598,876	4,089,700
Training and Development Fund	27,563	13,782					41,345
Total Revenue	**1,120,350**	**3,796,391**	**3,988,789**	**3,785,691**	**3,666,858**	**2,360,578**	**18,718,657**
Expenses:							
Accessible Housing Unit	276,743	-	-	-	-	-	276,743
Multi-Client Six Plex	-	1,823,308	1,823,308	1,823,308	1,823,308	1,823,308	9,116,540
Detached Single Family Unit	-	320,446	348,419	320,446	312,959		1,302,270
NZE Retrofit	177,565	710,260	887,825	887,825	887,825	887,825	4,439,125
Training & Development	50,000	35,000	25,000	15,000			125,000
Program Administration	325,550	325,550	325,550	325,550	325,550	325,550	1,953,300
Solar Technologies	50,000	275,000	300,000	300,000	300,000	275,000	1,500,000
Total Expenses	879,858	3,489,564	3,710,102	3,672,129	3,649,642	3,311,683	18,712,978
EXCESS (DEFICIENCY) OF REVENUE OVER EXPENSES	240,492	306,827	278,687	113,562	17,216	951,105	5,679
FUND BALANCE-BEGINNING OF YEAR	-	240,492	547,319	826,006	939,568	956,784	
FUND BALANCE-END OF YEAR	**240,492**	**547,319**	**826,006**	**939,568**	**956,784**	**5,679**	**5,679**

Figure 7. Proforma Financial Statements

The proforma financial statements does not reflect the bulk ordering of all construction material (excluding electrical, plumbing, heating and ventilation) which will be purchased by Stajune Construction in the Fall of year-1, for construction projects to be carried on in year 2 and every subsequent year.

Figure 8. Quarterly Expenses per Year.

CASH OUT SPLIT BY QUARTER AND YEAR							
Year/Quarter	**Q1**	**Q2**	**Q3**	**Q4**	**Total expenses per year**	**Other Expenses maintenance:**	**Total Cash Out per year**
2020			$ 617,075.00	$ 262,783.00	$ 879,858.00		$ 879,858.00
2021	$ 537,214.50	$ 537,214.50	$ 1,247,790.50	$ 1,167,344.50	$ 3,489,564.00		$ 3,489,564.00
2022	$ 537,214.50	$ 537,214.50	$ 1,354,546.00	$ 1,281,127.00	$ 3,710,102.00		$ 3,710,102.00
2023	$ 537,214.50	$ 537,214.50	$ 1,316,573.00	$ 1,281,127.00	$ 3,672,129.00		$ 3,672,129.00
2024	$ 537,214.50	$ 537,214.50	$ 1,294,086.00	$ 1,281,127.00	$ 3,649,642.00		$ 3,649,642.00
2025	$ 537,214.50	$ 537,214.50	$ 981,127.00	$ 1,256,127.00	$ 3,311,683.00		$ 3,311,683.00

Class B Methods and Assumptions

As the CNE NZE program is primarily comprised of capital projects relating to construction, the below Figure 9 was used as the basis for construction Class "A" through "D" estimates.

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Figure 9. Construction Class Estimates

Class of estimate	Design Estimate Effort	Project Contingency Range (%)		Cost estimate basis	
				Materials	Labor
		(-)	(+)		
A	Finalized (100% complete tender documents)	5%	10%	As for Class B, with material on approx. 100% firm basis	As for Class B, some actual field labor productivity may be available
B	Detailed (66%Design development)	10%	15%	Firm unit cost quotes based on detailed quantity take-off	Estimated man-hour units (including assessment) using expected labor rate for each job classification
C	Preliminary (33%Design development)	15%	20%	Labor/material ratios for similar work, adjusted for site conditions and using expected labor rates	
D	Concept (simplified)	20%	30%	By overall project or by ratio to area or global project unit and comparison with similar work with materials adjusted to current cost indices and labor adjusted to site conditions.	

Estimates were realized by an Indigenous engineering firm involved in Indigenous construction projects and are specialised in construction project management. These estimates were based on completed preliminary design drawings, including definition of major systems and subsystems and outline specifications. These documents were prepared by an Architectural Technician under supervision of the Designer and a net-zero builder. The estimates include documented work breakdown and quantities calculations. Rough material prices used for the estimates were provided by a regional supplier. Mechanical equipment and other material prices were based on budget bids obtained from various suppliers. Realistic assumptions were made on labour productivity. Labour rates were based on rates established by the Commission de la construction du Québec and the estimated ratios of local and external tradespeople. Finally, estimates were cross-checked by using a unit price method based on similar project experiences.

Contributions from other Sources

The CNE NZE program will leverage revenues generated as set out above, other contributions and the Smart Cities prize money to amplify the impact and reach of our program by

- applying for additional provincial and federal funding geared toward enhancing accessibility for persons with disabilities
- obtaining in-kind contributions and/or financial assistance from our partners and government programs including
  - the Concordia University Centre for Net-Zero Energy Building Studies in-kind and financial contributions through funding received from (NSERC) that supports its net zero research projects and initiatives

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- McGill University research carried out under a research grant funded by CMHC under its Research Planning Fund (RPF) (See Annex – Letter of Approval)
- Cree Human Resources Development is subsidizing the salaries of three local youth to assist CNE with project coordination and proposal development
- CMHC is contributing funding under a youth work experience program in relation to research and team environment initiatives via a grant through the Housing Internship Initiative for First Nation and Inuit Youth program (HIIFNIY)(See Annex *)

The CNE's project management team will continually apply to funding programs and other revenue sources to leverage success. This includes any local, regional and national programs that support Indigenous and accessible housing, green technologies, capacity building, smart technologies and research that captures net-zero development and the human experience related to our project to ensure sustainability beyond the Smart Cities Challenge.

With that said, this Smart Cities Challenge has already yielded success for the CNE. The CNE approached housing holistically from a 360-perspective for the comprehensive engagement of all stakeholders including community members, academia, industry experts and the supply chain. By undertaking this approach with a more fulsome consultation of the supply chain and industry stakeholders, the CNE was able find significant savings compared to the way business was normally done. In fact, detailed costing of the CNE prototypes was initially estimated at $3M for the Six-Plex however the Class B estimates for the Six-Plex came in under $2M resulting in greater affordability per unit. This cost savings also applies to all other new units built under our program.

Financial Tools and Methodologies

Fund accounting is the financial methodology used by the CNE that results in a self-balancing set of accounts for each fund established by legal, contractual or voluntary actions. Transactions are accounted for under five different funds established by laws. The accounting software, Sage 300, as well as Committed Cost systems are used for the financial operations. Those systems enable the CNE to account for expenses by department at the General Ledger level. The departments represent projects for the Special Projects Fund, the same applies to the General Operation Fund and the Capital Additions Fund.

Committed Cost systems enable the issuance of purchase orders related to specific projects taking into consideration the available budget per account and fiscal period. This information is transferred into Sage 300 in order to provide reporting per project including actual costs, budgets as well as commitments. The financial plan for our NZE program is based on budgeted cash flows on an accrual basis.

Project management implementation will use MS Project along with the principles outlined by the Project Management Institute (PMI) for project management and with cost

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accounting methodologies managed through Sage 300. The CNE will further ensure proper project management by implementing all aspects of our ISO/IMS.

Risk Identification and Mitigation

Below are the risks identified by the CNE with respect to the financial operations of its NZE program.

Table 22 - Risk Analysis

Risks	Preventive Measures	Corrective Measures
Cost overruns	▪ Implement contractor/supplier management best practices ▪ Hire an experienced construction project manager and site supervisor ▪ Conduct audit on all construction and project management processes	▪ Adjust project scope and budgets ▪ Identify root cause and implement audit findings to improve efficiency
Unable to sell units as individuals can't qualify for a mortgage	Pre-screen and pre-qualify parties	▪ Identify additional purchasers ▪ Re-classify a 'for sale' unit as a conditional rent to own until the potential purchaser can qualify for a mortgage
Construction company unable to secure necessary resources for construction	Assist companies in securing capital funds on a project by project basis	▪ Foster partnerships and joint ventures between companies to improve their financial capacity ▪ Directly manage the project through Eastmain's development corporation ▪ Increase CNE's investment into the project
Cost of constructing net zero homes is too expensive in Eastmain	▪ Scale project to "net-zero ready" energy performance ▪ Identify and secure federal and/or provincial green energy subsidies to offset the cost of the alternative energy systems (e.g. solar) ▪ Redesign units to accommodate a smaller living space	▪ CNE develops an in-house green energy subsidy program ▪ Re-evaluate and redesign the construction system ▪ Build smaller units ▪ Enter into agreements with companies that result in lower profit margins in exchange for project guarantees
Insufficient rent collection on rental units to help support operation and maintenance and reinvestment into future construction	▪ Pre-qualifying renters by verifying their credit history ▪ Request rental deposits ▪ Verify capacity to pay ▪ Credit bureau reporting ▪ Ensure rental agreements are fair and drafted to look after the best interests of both parties while protecting the investment of the property owner	▪ Terminate occupant's rental agreement as a result of failing to pay and evict the tenant ▪ Amend rental agreement to require a co-signer whom would also be liable for any rental arrears ▪ Institute penalties through forfeiture of local subsidies and automatically apply grant to rental arrears ▪ Suspend eligibility for local grants, loans and subsidies to persons with rental arrears ▪ Take legal action
Negotiations with the supply chain are not successful in reducing the current cost of materials	▪ Pre-discussions with suppliers with regards to what we are trying to achieve with the SCC to foster win-win relationships ▪ Expand the list of suppliers that are approached	Re-tender the ordering of materials

Finalist Grant Report

The CNE supplemented the finalist grant with funds from its operations and partners to help offset the costs associated with project coordination, proposal development and the activities needed to design and build its systems and costing. The finalist grant funding was used along with CNE funds to develop the final proposal. Detailed use of those resources are as follows:

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- **Project Coordination**

  Expenses for the assignment and reassignment of CNE personnel to coordinate all project activities through the project management team

- **Stakeholder Engagement**

  Sessions were regularly held throughout the project development phase to acquire technical information and clarify expectations and roles of all stakeholders while obtaining feedback from the community members and all other interested parties

- **Proposal Development**

  Costs related to CNE staff time as well as the effort put forth in organizing information and assistance by partners to draft the final proposal

- **Building Designs and Systems expenditures** (architecture, energy modelling, engineering)

  Refining the designs of each of the housing prototypes that were developed based on extensive consultation with community members and resulted from energy modelling exercises and consultation with net-zero and local builders and the housing materials and equipment supply chain

- **Data Modelling**

  These costs were for the data modelling exercises required to determine the building system and technologies required to meet net-zero targets as part of the design process

- **Plans, Specs and Costing**

  These were incurred in developing the working drawings, design of the HVAC system and solar systems, analysis and selection of accessible housing equipment, and selection of the household lighting and other equipment

- **Jury Meetings**

  The costs for travel, lodging and per diem relating to meeting with the SCC Jury in Toronto to represent CNE's project and answer questions posed by the Jury.

Our project had a minor deviation regarding the original application. We decided to extend the project from five years to six years in order that year-1 could serve as a pilot year to ensure detailed costing is obtained through extensive project oversight and to identify true costs versus billed costs. The pilot year will be used to account for actual costs of material and labour to ensure data is available to properly analyse actual costs within the environment. This information will give policy makers data that reflects the northern reality thus enabling them to make informed decisions.

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Figure 10. Finalist Grant Financial Report

SMART CITIES CHALLENGE FINALIST GRANT

Project Revenues:

Smart Cities Challenge Finalist Grant	$ 250,000
Cree Nation of Eastmain	73,344
CMHC-HIIFNIY Fund	36,000
CHRD	27,563
Total Revenues	**$ 386,907**

Project Expenses:

Fiscal Year	**2018 - 2019**				**Total**
Financial periods	*Qrt 1*	*Qrt 2*	*Qtr 3*	*Qtr 4*	
Project Coordination	$ 1,500	$ 7,807	$ 12,194	$ 43,192	$ 64,693
Stakeholder Engagement Sessions:					
Community Members		11,666	4,050		15,716
Partners		1,757	12,759	1,500	16,015
Contractors and Suppliers			17,966	12,600	30,566
Proposal Development	18,807	8,100	15,136	107,392	149,435
Building Designs and Systems	13,376	3,450	31,831	16,100	64,757
Data Modeling			-	6,609	6,609
Plans, Specs and Costing			6,500	18,820	25,320
Jury Meetings			13,796		13,796
Total Quarterly Expenses	**$ 33,683**	**$ 32,780**	**$ 114,231**	**$ 206,213**	**$ 386,907**

Other Details

Class B estimates were established for the pilot construction of the Accessible House (first single-family house) and for the Six-Plex. A Class "B" estimate for the Six-Plex was derived from the detailed section, plans and elevations of the Six-Plex, and the costing for construction details and mechanical systems of the Accessible House (as these are the same construction details that will be used in all the NZE houses). For all other aspects of our project, Class "D" estimates will be used until building systems have been finalized and lessons learned from the pilot projects are applied. Plans and specs for Class "A" estimates for the tendering of the Accessible House will require identifying the specific exterior and interior finishing materials (flooring, lighting, etc.) and household equipment for the house.

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Table 23 – Detailed Costing of NZE Program

Detailed Cost (accessible house)				
		Unit Price	**Quantity**	**TOTAL COST**
FIXED ASSETS	Accessible Housing Unit	$232.52	1,190	$ 276,700.00
	NZE Retrofit	NA	NA	$ 177,600.00
	Multi-Client Six Plex	$222.76	8,185	$ 1,823,300.00
	Single Family Unit	$ 219.15	1,463	$ 320,500.00
	NZE Retrofit	NA	NA	$ 710,300.00
	Multi-Client Six Plex	$ 222.76	8,185	$ 1,823,300.00
	Single Family Unit	$238.22	1,463	$ 348,400.00
	NZE Retrofit	NA	NA	$ 887,800.00
	Multi-Client Six Plex	$ 22.76	8,185	$ 1,823,300.00
	Single Family Unit	$ 294.04	1,090	$ 320,500.00
	NZE Retrofit	NA	NA	$ 887,800.00
	Multi-Client Six Plex	$ 222.76	8,185	$ 1,823,300.00
	Single Family Unit	$ 231.85	1,350	$ 313,000.00
	NZE Retrofit	NA	NA	$ 887,800.00
	Multi-Client Six Plex	$ 222.76	8,185	$ 1,823,300.00
	NZE Retrofit	NA	NA	$ 887,800.00
	Training & Development	NA	NA	$ 125,000.00
	Program Administration	NA	NA	$ 1,953,300.00
	Solar Technologies	NA	NA	$ 1,500,000.00
TOTAL				**$ 18,713,000.00**

Note: The values are rounded.

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Class B Estimates for CNE NZE Program

Figure 11. Accessible House

Project: Accessible House
Project Nu : 028-19011
Prepared by : Jean Larouche
Type : New building
Location : Eastmain
Date: March 4th 2019
Revision 3

ID	Qty	Description	unit	PU	Material	Labor	Man-hours	Sub-total	Contingency Class B -10%	Contingency Class B 15%	Notes
1	1	Water input	gl	4 850,00 $	3 395,80 $	1 455,00 $	21	4 850,00 $	4 365,00 $	5 577,50 $	
2	430	Excavation/ embankment	m3	31,50 $	9 461,50 $	4 063,50 $	58	13 525,00 $	12 150,50 $	15 576,75 $	Mat included excavation equipment
3	7,5	**Foundations**	m3		**10 696,63 $**	**15 000,00 $**	**214**	**25 696,63 $**	**23 117,84 $**	**29 538,51 $**	Concrete : 300$/m3, mat includes pump
3,1	6	Main footing	m3	1 017,50 $	- $	- $	-	- $	- $	- $	
3,2	1,5	Isolated footing	m3	1 083,50 $	- $	- $	-	- $	- $	- $	
3,3	725	Isolated fundation walls	sq2	32,73 $	- $	- $	-	- $	- $	- $	
4	1240	**Building exterior walls**	sq2								
4,1	1240	Structure and insulation	sq2	11,28 $	8 708,40 $	5 015,80 $	72	11 774,20 $	10 551,78 $	13 481,83 $	
		Insulation			2 756,80 $	- $		2 756,80 $	2 481,12 $	2 595,32 $	
4,2	1300	Outdoor siding (Cavarel)	sq2	8,25 $	4 134,00 $	6 591,00 $	94	10 725,00 $	9 652,50 $	12 333,75 $	
4,3	1	Doors and windows (triple verres)	gl	11 725,00 $	12 926,38 $	5 539,38 $	79	18 466,25 $	16 619,63 $	21 236,19 $	1 bid
5	1200	**Main floor**	sq2								
5,1	1200	Structure	sq2	7,54 $	4 272,00 $	3 000,00 $	43	7 272,00 $	6 544,80 $	8 362,80 $	
5,2	1200	Flooring	sq2	7,45 $	4 023,00 $	4 917,00 $	70	8 940,00 $	8 046,00 $	10 281,00 $	Includes ceramic and vinyl (no price from rona for materials)
6	2100	**Roof**	sq2								
6,1	2100	Structure and insulation	sq2	11,81 $	10 710,00 $	14 847,50 $	361	24 837,50 $	22 353,75 $	28 563,38 $	Includes White environment
		Insulation			1 781,00 $			1 781,00 $	1 602,90 $	2 048,15 $	
6,2	2100	Roofing	sq2	3,91 $	1 765,00 $	3 290,00 $	46	4 985,00 $	4 486,50 $	5 732,75 $	local labor
6,3	2100	Finition	sq2	2,15 $	1 533,00 $	2 971,50 $	42	4 504,50 $	4 054,05 $	5 180,18 $	
7	1200	**Concrete slab**	sq2								
7,1	1200	Insulation	sq2	6,33 $	2 796,00 $	1 500,00 $	21	4 296,00 $	3 866,40 $	4 940,40 $	
7,2	1200	Concrete and finition	sq2	7,08 $	3 335,00 $	4 000,00 $	57	7 335,00 $	6 601,50 $	8 435,25 $	Mat price includes pump
8	155	**Interior walls**	sq								
8,1	155	Framing	sq	42,35 $	2 464,50 $	4 099,75 $	59	6 564,25 $	5 907,83 $	7 548,89 $	
8,2	10	Interior doors	unit	332,50 $	2 357,00 $	2 868,00 $	41	5 225,00 $	4 702,50 $	6 008,75 $	
8,3	3200	Drywall	sq2	2,37 $	1 888,00 $	5 680,00 $	81	7 568,00 $	6 811,20 $	8 703,20 $	
8,4	5000	Plastering	sq2	1,00 $	1 150,00 $	3 450,00 $	49	4 600,00 $	4 140,00 $	5 290,00 $	
8,5	5000	Painting	sq2	1,30 $	2 484,00 $	5 796,00 $	83	8 280,00 $	7 452,00 $	9 522,00 $	

Project: Accessible House
Project Nu : 028-19011
Prepared by : Jean Larouche
Type : New building
Location : Eastmain
Date: March 4th 2019
Revision 3

ID	Qty	Description	unit	PU	Material	Labor	Man-hours	Sub-total	Contingency Class B -10%	Contingency Class B 15%	Notes
9	1	**Plumbing**	gl								
9,1	1	Water input	gl	3 250,00 $	1 389,38 $	1 698,13 $	24	3 087,50 $	2 778,75 $	3 550,63 $	
9,2	1	Distribution	gl	13 868,37 $	5 928,73 $	7 246,22 $	104	13 174,95 $	11 857,46 $	15 151,19 $	
9,3	1	Accessories	gl	10 257,04 $	7 306,14 $	2 436,05 $	35	9 744,19 $	8 769,77 $	11 205,82 $	
10	1	**Electricity**									
10,1	1	Electric input	gl	4 650,00 $	2 871,38 $	1 546,13 $	22	4 417,50 $	3 975,75 $	5 080,13 $	
10,2	1	Distribution	gl	13 150,00 $	5 621,63 $	6 870,88 $	98	12 492,50 $	11 243,25 $	14 366,38 $	
10,3	1	Lighting/accessories/fixtures	gl	2 500,00 $	1 781,25 $	593,75 $	8	2 375,00 $	2 137,50 $	2 731,25 $	
11	1	**Ventilation**									Bid for HVAC equipment
11,1	1	HVAC unit	gl	11 175,00 $	8 224,80 $	2 056,20 $	23	10 281,00 $	9 252,90 $	11 823,15 $	
11,2	1	Distribution	gl	8 257,04 $	3 798,24 $	3 798,24 $	54	7 596,48 $	6 836,83 $	8 735,95 $	
11,2	1	Grid and accessories	gl	2 450,00 $	1 127,00 $	1 127,00 $	16	2 254,00 $	2 028,60 $	2 592,10 $	
12	1	**Cabinet making**	gl	15 200,00 $	13 844,16 $	1 588,24 $	21,97 $	15 382,40 $	13 844,16 $	17 689,76 $	
13	1	**Electricity (Hydro-Quebec)**	gl	- $	- $	- $	- $	- $	- $	- $	
14	1	**Wood Stove**	gl	12 500,00 $	11 250,00 $	1 250,00 $	17,86 $	12 500,00 $	11 250,00 $	14 375,00 $	bid for equipement
				Material from Rona :	$6 787,23 $						
				Total :	**153 891,80 $**	**123 350,75 $**	**1 762**	**276 742,55 $**	**249 068,29 $**	**318 253,93 $**	
		Building area	1190	sq1			Cost by sq1 :	$ 232,56	$ 209,30	$ 267,44	

Assumptions
Materials costs by Rona from edmonton contractor estimate (transport to Eastmain included) for a total of $6 787.23$
Labor: 60% of the workers are locals (50$/h) and 40% of the workers are externals (100$/h including lodging, catering and transport)
1760MH: 10 weeks-4 workers-40h/sem
No project management included

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Figure 12. Six-Plex

Ashini CONSULTANTS

Project: Six Plex
Project Nu : 028-19011
Prepared by : Jean Larouche
Type : New building
Location : Eastmain
Date : March 4th 2019
Revision 0

ID	Qty	Description	unit	PU	Material	Labor	Man-hours	Sub-total	Contingency Class B -10%	Contingency Class B 15%	Notes
1	6	Water input	gl	2 750,00 $	11 550,00 $	4 950,00 $	71	16 500,00 $	14 850,00 $	18 975,00 $	
2	1125	Excavation/ embankment	m3	31,50 $	24 806,25 $	10 631,25 $	152	35 437,50 $	31 893,75 $	40 753,13 $	Mat included excavation equipement
3	**24**	**Foundations**	**m3**		**34 196,90 $**	**51 471,85 $**	**735**	**85 668,75 $**	**77 101,88 $**	**98 519,06 $**	Concrete : 300$/m3, mat includes pump
3,1	18	Main footing	m3	1 325,00 $	- $	- $	-	- $	- $	- $	
3,2	6	Isolated footing	m3	1 050,00 $	- $	- $	-	- $	- $	- $	
3,3	1645	Isolated fundation walls	sq2	33,75 $	- $	- $	-	- $	- $	- $	
4	**7345**	**Building exterior walls**	**sq2**								
4,1	7345	Structure	sq2	7,25 $	39 736,45 $	13 514,80 $	193	53 251,25 $	47 926,13 $	61 238,94 $	
4,2	7345	Insulation	sq2	4,20 $	13 367,90 $	17 481,10 $	250	30 849,00 $	27 764,10 $	35 476,35 $	
4,3	6230	Outdoor siding (Canexel)	sq2	13,50 $	19 811,40 $	64 293,60 $	918	84 105,00 $	75 694,50 $	96 720,75 $	
4,4	1	Doors and windows (triple glasses)	gl	98 980,00 $	79 184,00 $	19 796,00 $	283	98 980,00 $	89 082,00 $	113 827,00 $	1 bid for windows
5	**5890**	**Main floor**	**sq2**								
5,1	5890	Structure	sq2	8,50 $	20 968,40 $	29 096,60 $	416	50 065,00 $	45 058,50 $	57 574,75 $	
5,2	5890	Flooring	sq2	7,50 $	19 878,75 $	24 298,25 $	347	44 175,00 $	39 757,50 $	50 801,25 $	Includes ceramic and vinyl (no price from rona for material)
6	**4165**	**Second floor**	**sq2**								
6,1	4165	Structure	sq2	7,00 $	14 827,40 $	14 327,60 $	205	29 155,00 $	26 239,50 $	33 528,25 $	
6,2	4165	Flooring	sq2	7,50 $	14 056,88 $	17 180,63 $	245	31 237,50 $	28 113,75 $	35 923,13 $	Includes ceramic and vinyl (no price from rona for material)
7	**15757**	**Roof**	**sq2**								
7,1	15757	Structure	sq2	12,75 $	67 597,53 $	133 304,22 $	1 904	200 901,75 $	180 811,58 $	231 037,01 $	Includes lifting equipment
7,2	6100	Insulation	sq2	4,50 $	17 995,00 $	9 455,00 $	135	27 450,00 $	24 705,00 $	31 567,50 $	
7,3	15757	Roofing	sq2	4,15 $	13 393,45 $	51 998,10 $	743	65 391,55 $	58 852,40 $	75 200,28 $	
7,4	15757	Finition	sq2	2,75 $	11 502,61 $	31 829,14 $	455	43 331,75 $	38 998,58 $	49 831,51 $	
8	**5890**	**Concrete slab**	**sq2**								
8,1	5890	Insulation	sq2	5,75 $	13 723,70 $	20 143,80 $	288	33 867,50 $	30 480,75 $	38 947,63 $	
8,2	5890	Concrete and finition	sq2	7,25 $	16 333,71 $	26 368,79 $	377	42 702,50 $	38 432,25 $	49 107,88 $	Mat price includes pump
9	**2108**	**Interior walls**	**sq**								
9,1	2108	Framing	sq	38,50 $	33 517,20 $	47 640,80 $	681	81 158,00 $	73 042,20 $	93 331,70 $	
9,2	6	Stairs	unit	4 250,00 $	9 753,75 $	15 746,25 $	225	25 500,00 $	22 950,00 $	29 325,00 $	
9,3	114	Interior doors	unit	475,00 $	26 869,80 $	27 280,20 $	390	54 150,00 $	48 735,00 $	62 272,50 $	
9,4	44047	Drywall	sq2	2,15 $	25 987,73 $	68 713,32 $	982	94 701,05 $	85 230,95 $	108 906,21 $	
9,5	39707	Plastering	sq2	1,00 $	9 017,61 $	30 189,39 $	431	39 207,00 $	35 286,30 $	45 088,05 $	
9,6	39207	Painting	sq2	1,80 $	19 478,04 $	51 094,56 $	730	70 572,60 $	63 515,34 $	81 158,49 $	

Ashini CONSULTANTS

Project: Six Plex
Project Nu : 028-19011
Prepared by : Jean Larouche
Type : New building
Location : Eastmain
Date : March 4th 2019
Revision 0

ID	Qty	Description	unit	PU	Material	Labor	Man-hours	Sub-total	Contingency Class B -10%	Contingency Class B 15%	Notes
10	**6**	**Plumbing**	**gl**								
10,1	6	Water input	gl	2 650,00 $	7 155,00 $	8 745,00 $	125	15 900,00 $	14 310,00 $	18 285,00 $	
10,2	6	Distribution	gl	11 750,00 $	31 725,00 $	38 775,00 $	554	70 500,00 $	63 450,00 $	81 075,00 $	
10,3	6	Accessories	gl	5 350,00 $	24 075,00 $	8 025,00 $	115	32 100,00 $	28 890,00 $	36 915,00 $	
11	**6**	**Electricity**									
11,1	6	Electric input	gl	4 150,00 $	16 185,00 $	8 715,00 $	125	24 900,00 $	22 410,00 $	28 635,00 $	
11,2	6	Distribution	gl	10 150,00 $	27 405,00 $	33 495,00 $	479	60 900,00 $	54 810,00 $	70 035,00 $	
11,3	6	Lighting/accessories/fixtures	gl	2 500,00 $	11 250,00 $	3 750,00 $	54	15 000,00 $	13 500,00 $	17 250,00 $	
12	**6**	**Ventilation**									Bid for HVAC equipement
12,1	6	HVAC unit	gl	11 175,00 $	53 640,00 $	13 410,00 $	192	67 050,00 $	60 345,00 $	77 107,50 $	
12,2	6	Distribution	gl	8 750,00 $	26 250,00 $	26 250,00 $	375	52 500,00 $	47 250,00 $	60 375,00 $	
12,3	6	Grid and accessories	gl	2 050,00 $	6 150,00 $	6 150,00 $	88	12 300,00 $	11 070,00 $	14 145,00 $	
13	**6**	**Cabinet making**	**gl**	**11 200,00 $**	**60 480,00 $**	**6 720,00 $**	**96**	**67 200,00 $**	**60 480,00 $**	**77 280,00 $**	
14	**6**	**Electricity (Hydro-Quebec)**	**gl**	**- $**	**- $**	**- $**	**-**	**- $**	**- $**	**- $**	
15	**6**	**Wood Stove**	**gl**	**11 100,00 $**	**59 940,00 $**	**6 660,00 $**	**95**	**66 600,00 $**	**59 940,00 $**	**76 590,00 $**	Bid for equipement
				Material from Rona :	355 001,77 $						
				Total :	**881 809,44 $**	**941 498,26 $**	**13 450**	**1 823 307,70 $**	**1 640 976,93 $**	**2 096 803,86 $**	
		Building area		8185	sq2			Cost by sq2:	$ 222,76	$ 200,49	$ 256,18

Assumptions

Materials costs by Rona from edmonton contractor estimate (transport to Eastmain included)
Labor: 60% of the workers are locals (50$/h) and 40% of the workers are externals (100$/h including lodging, catering and transport)
No project management included

Processed under the provisions of the Access to Information Act /Révisé en vertu de la Loi sur l'accés à l'information

Figure 13. Starter House

Project: **Home Ownership** Date : March 4th 2019
Project Nu : 028-19011 Revision 0
Prepared by : Jean Larouche
Type : New building
Location : Eastmain

ID	Qty	Description	unit	PU	Material	Labor	Man-hours	Sub-total	Contingency Class B -10%	Contingency Class B 15%	Notes
1	1	Water input	gl	2 750,00 $	1 925,00 $	825,00 $	12	2 750,00 $	2 475,00 $	3 162,50 $	
2	180,00	Excavation/ embankment	m3	31,50 $	3 969,00 $	1 701,00 $	24	5 670,00 $	5 103,00 $	6 520,50 $	Mat included excavation equipement
3	14	**Foundations**	m3		19 948,19 $	34 501,81 $	493	54 450,00 $	49 005,00 $	62 617,50 $	Concrete : 300$/m3, mat includes pump
3,1	12	Main footing	m3	1 325,00 $	- $	- $	-	- $	- $	- $	
3,2	2	Isolated footing	m3	1 050,00 $	- $	- $	-	- $	- $	- $	
3,3	1080	Isolated fundation walls	sq2	33,75 $	- $	- $	-	- $	- $	- $	
4	1992	**Building exterior walls**	sq2								
4,1	1992	Structure	sq2	8,75 $	10 776,72 $	6 653,28 $	95	17 430,00 $	15 687,00 $	20 044,50 $	
4,2	1992	Insulation	sq2	4,20 $	3 625,44 $	4 740,96 $	68	8 366,40 $	7 529,76 $	9 621,36 $	
4,3	2575	Outdoor siding (Canexel)	sq2	14,75 $	8 188,50 $	29 792,75 $	426	37 981,25 $	34 183,13 $	43 678,44 $	
4,4	1	Doors and windows (triple glasses)	gl	27 500,00 $	22 000,00 $	5 500,00 $	79	27 500,00 $	24 750,00 $	31 625,00 $	1 bid for windows
5	1585	**Main floor**	sq2								
5,1	1585	Structure	sq2	9,50 $	5 642,60 $	9 414,90 $	134	15 057,50 $	13 551,75 $	17 316,13 $	
5,2	1585	Flooring	sq2	7,50 $	5 349,38 $	6 538,13 $	93	11 887,50 $	10 698,75 $	13 670,63 $	Includes ceramic and vinyl (no price from rona for material)
6	1900	**Roof**	sq2								
6,1	1900	Structure	sq2	14,50 $	8 151,00 $	19 399,00 $	277	27 550,00 $	24 795,00 $	31 682,50 $	Includes lifting equipment
6,2	810	Insulation	sq2	4,50 $	2 389,50 $	1 255,50 $	18	3 645,00 $	3 280,50 $	4 191,75 $	
6,3	1900	Roofing	sq2	4,35 $	1 615,00 $	6 650,00 $	95	8 265,00 $	7 438,50 $	9 504,75 $	
6,4	1900	Finition	sq2	3,15 $	1 387,00 $	4 598,00 $	66	5 985,00 $	5 386,50 $	6 882,75 $	
7	835	**Concrete slab**	sq2								
7,1	835	Insulation	sq2	5,75 $	1 945,55 $	2 855,70 $	41	4 801,25 $	4 321,13 $	5 521,44 $	
7,2	835	Concrete and finition	sq2	7,25 $	2 315,56 $	3 738,19 $	53	6 053,75 $	5 448,38 $	6 961,81 $	Mat price includes pump
8	2108	**Interior walls**	sq								
8,1	155	Framing	sq	38,50 $	2 464,50 $	3 503,00 $	50	5 967,50 $	5 370,75 $	6 862,63 $	
8,2	15	Interior doors	unitée	475,00 $	3 535,50 $	3 589,50 $	51	7 125,00 $	6 412,50 $	8 193,75 $	
8,3	2825	Drywall	sq2	2,15 $	1 666,75 $	4 407,00 $	63	6 073,75 $	5 466,38 $	6 984,81 $	
8,4	2825	Plastering	sq2	1,00 $	649,75 $	2 175,25 $	31	2 825,00 $	2 542,50 $	3 248,75 $	
8,5	2825	Painting	sq2	1,80 $	1 403,46 $	3 681,54 $	53	5 085,00 $	4 576,50 $	5 847,75 $	
8,5	3250	Painting	sq2	1,80 $	1 614,60 $	4 235,40 $	61	5 850,00 $	5 265,00 $	6 727,50 $	

Project: **Home Ownership** Date : March 4th 2019
Project Nu : 028-19011 Revision 0
Prepared by : Jean Larouche
Type : New building
Location : Eastmain

ID	Qty	Description	unit	PU	Material	Labor	Man-hours	Sub-total	Contingency Class B -10%	Contingency Class B 15%	Notes
9	1	**Plumbing**	gl								
9,1	1	Water input	gl	2 650,00 $	1 192,50 $	1 457,50 $	21	2 650,00 $	2 385,00 $	3 047,50 $	
9,2	1	Distribution	gl	10 500,00 $	4 725,00 $	5 775,00 $	83	10 500,00 $	9 450,00 $	12 075,00 $	
9,3	1	Accessories	gl	3 250,00 $	2 437,50 $	812,50 $	12	3 250,00 $	2 925,00 $	3 737,50 $	
10	1	**Electricity**									
10,1	1	Electric input	gl	3 500,00 $	2 275,00 $	1 225,00 $	18	3 500,00 $	3 150,00 $	4 025,00 $	
10,2	1	Distribution	gl	12 750,00 $	5 737,50 $	7 012,50 $	100	12 750,00 $	11 475,00 $	14 662,50 $	
10,3	1	Lighting/accessories/fixtures	gl	3 150,00 $	2 362,50 $	787,50 $	11	3 150,00 $	2 835,00 $	3 622,50 $	
11	1	**Ventilation**									Bid for HVAC equipement
11,1	1	HVAC unit	gl	12 500,00 $	10 000,00 $	2 500,00 $	36	12 500,00 $	11 250,00 $	14 375,00 $	
11,2	1	Distribution	gl	12 000,00 $	6 000,00 $	6 000,00 $	86	12 000,00 $	10 800,00 $	13 800,00 $	
11,3	1	Grid and accessories	gl	2 050,00 $	1 025,00 $	1 025,00 $	15	2 050,00 $	1 845,00 $	2 357,50 $	
12	1	**Cabinet making**	gl	10 500,00 $	9 450,00 $	1 050,00 $	15	10 500,00 $	9 450,00 $	12 075,00 $	
13	1	**Electricity (Hydro-Quebec)**	gl	- $	- $	- $	-	- $	- $	- $	
14	1	**Wood Stove**	gl	11 100,00 $	9 990,00 $	1 110,00 $	16	11 100,00 $	9 990,00 $	12 765,00 $	Bid for equipement
				Materials from Rona :	73 651,81 $						
				Total :	**164 143,39 $**	**184 275,51 $**	**2 633**	**348 418,90 $**	**313 577,01 $**	**400 681,74 $**	
			Building area	1090 sq2				**Cost by sq2:**	$ 319,65	$ 287,69	$ 367,60

Assumptions
Materials costs by Rona from edmonton contractor estimate (transport to Eastmain included)
Labor: 60% of the workers are locals (50$/h) and 40% of the workers are externals (100$/h including lodging, catering and transport)
No project management included

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Figure 14. Elders' House

Project: **Elder's house** Date : March 4th 2019
Project Nu : 028-19011 Revision 0
Prepared by : Jean Larouche
Type : New building
Location : Eastmain

ID	Qty	Description	unit	PU	Material	Labor	Man-hours	Sub-total	Contingency Class B -10%	Contingency Class B 15%	Notes
1	1	Water input	gl	2 750,00 $	1 925,00 $	825,00 $	12	2 750,00 $	2 475,00 $	3 162,50 $	
2	220,00	Excavation/ embankment	m3	31,50 $	4 851,00 $	2 079,00 $	30	6 930,00 $	6 237,00 $	7 969,50 $	Mat included excavation equipement
3	**17**	**Foundations**	**m3**		**24 222,80 $**	**40 137,20 $**	**573**	**64 360,00 $**	**57 924,00 $**	**74 014,00 $**	Concrete : 300$/m3, mat includes pump
3,1	14	Main footing	m3	1 325,00 $	- $	- $	-	- $	- $	- $	
3,2	3	Isolated footing	m3	1 650,00 $	- $	- $	-	- $	- $	- $	
3,3	1264	Isolated fundation walls	sq2	33,75 $	- $	- $	-	- $	- $	- $	
4	**1741**	**Building exterior walls**	**sq2**								
4,1	1468	Structure	sq2	7,25 $	7 941,88 $	2 701,12 $	39	10 643,00 $	9 578,70 $	12 239,45 $	
4,2	1468	Insulation	sq2	4,20 $	2 671,76 $	3 493,84 $	50	6 165,60 $	5 549,04 $	7 090,44 $	
4,3	1468	Outdoor siding (Canexel)	sq2	15,50 $	4 668,24 $	18 085,76 $	258	22 754,00 $	20 478,60 $	26 167,10 $	
4,4	1	Doors and windows (triple glasses)	gl	20 250,00 $	16 200,00 $	4 050,00 $	58	20 250,00 $	18 225,00 $	23 287,50 $	1 bid for windows
5	**1462,5**	**Main floor**	**sq2**								
5,1	1350	Structure	sq2	9,50 $	4 806,00 $	8 019,00 $	115	12 825,00 $	11 542,50 $	14 748,75 $	
5,2	1350	Flooring	sq2	7,50 $	4 556,25 $	5 568,75 $	80	10 125,00 $	9 112,50 $	11 643,75 $	Includes ceramic and vinyl (no price from rona for material)
6	**1986**	**Roof**	**sq2**								
6,1	1986	Structure	sq2	12,50 $	8 519,94 $	16 305,06 $	233	24 825,00 $	22 342,50 $	28 548,75 $	Includes lifting equipment
6,2	1520	Insulation	sq2	4,50 $	4 484,00 $	2 356,00 $	34	6 840,00 $	6 156,00 $	7 866,00 $	
6,3	1986	Roofing	sq2	4,15 $	1 688,10 $	6 553,80 $	94	8 241,90 $	7 417,71 $	9 478,19 $	
6,4	1986	Finition	sq2	2,75 $	1 449,78 $	4 011,72 $	57	5 461,50 $	4 915,35 $	6 280,73 $	
7	**1462,5**	**Concrete slab**	**sq2**								
7,1	1190	Insulation	sq2	5,75 $	2 772,70 $	4 069,80 $	58	6 842,50 $	6 158,25 $	7 868,88 $	
7,2	1190	Concrete and finition	sq2	7,25 $	3 300,02 $	5 327,48 $	76	8 627,50 $	7 764,75 $	9 921,63 $	Mat price includes pump
8	**2108**	**Interior walls**	**sq**								
8,1	110	Framing	sq	38,50 $	1 749,00 $	2 486,00 $	36	4 235,00 $	3 811,50 $	4 870,25 $	
8,2	12	Interior doors	unitée	475,00 $	2 828,40 $	2 871,60 $	41	5 700,00 $	5 130,00 $	6 555,00 $	
8,3	2350	Drywall	sq2	2,15 $	1 386,50 $	3 666,00 $	52	5 052,50 $	4 547,25 $	5 810,38 $	
8,4	2350	Plastering	sq2	1,00 $	540,50 $	1 809,50 $	26	2 350,00 $	2 115,00 $	2 702,50 $	
8,5	2350	Painting	sq2	1,80 $	1 167,48 $	3 062,52 $	44	4 230,00 $	3 807,00 $	4 864,50 $	

Project: **Elder's house** Date : March 4th 2019
Project Nu : 028-19011 Revision 0
Prepared by : Jean Larouche
Type : New building
Location : Eastmain

ID	Qty	Description	unit	PU	Material	Labor	Man-hours	Sub-total	Contingency Class B -10%	Contingency Class B 15%	Notes
9	**1**	**Plumbing**	**gl**								
9,1	1	Water input	gl	2 650,00 $	1 192,50 $	1 457,50 $	21	2 650,00 $	2 385,00 $	3 047,50 $	
9,2	1	Distribution	gl	9 150,00 $	4 117,50 $	5 032,50 $	72	9 150,00 $	8 235,00 $	10 522,50 $	
9,3	1	Accessories	gl	3 250,00 $	2 437,50 $	812,50 $	12	3 250,00 $	2 925,00 $	3 737,50 $	
10	**1**	**Electricity**									
10,1	1	Electric input	gl	3 500,00 $	2 275,00 $	1 225,00 $	18	3 500,00 $	3 150,00 $	4 025,00 $	
10,2	1	Distribution	gl	9 150,00 $	4 117,50 $	5 032,50 $	72	9 150,00 $	8 235,00 $	10 522,50 $	
10,3	1	Lighting/accessories/fixtures	gl	3 150,00 $	2 362,50 $	787,50 $	11	3 150,00 $	2 835,00 $	3 622,50 $	
11	**1**	**Ventilation**									Bid for HVAC equipement
11,1	1	HVAC unit	gl	10 250,00 $	8 200,00 $	2 050,00 $	29	10 250,00 $	9 225,00 $	11 787,50 $	
11,2	1	Distribution	gl	9 000,00 $	4 500,00 $	4 500,00 $	64	9 000,00 $	8 100,00 $	10 350,00 $	
11,3	1	Grid and accessories	gl	2 050,00 $	1 025,00 $	1 025,00 $	15	2 050,00 $	1 845,00 $	2 357,50 $	
12	**1**	**Cabinet making**	**gl**	**10 500,00 $**	**9 450,00 $**	**1 050,00 $**	**15**	**10 500,00 $**	**9 450,00 $**	**12 075,00 $**	
13	**1**	**Electricity (Hydro-Quebec)**	**gl**	**- $**	**- $**	**- $**	**-**	**- $**	**- $**	**- $**	
14	**1**	**Wood Stove**	**gl**	**11 100,00 $**	**9 990,00 $**	**1 110,00 $**	**16**	**11 100,00 $**	**9 990,00 $**	**12 765,00 $**	Bid for equipement
				Materials from Rona :	72 489,12 $						
				Total :	**151 396,85 $**	**161 561,65 $**	**2 308**	**312 958,50 $**	**281 662,65 $**	**359 902,28 $**	
			Building area	**1350**	**sq2**		**Cost by sq2:**	**$ 231,82**	**$ 208,64**	**$ 266,59**	

Assumptions
Materials costs by Rona from edmonton contractor estimate (transport to Eastmain included)
Labor: 60% of the workers are locals (50$/h) and 40% of the workers are externals (100$/h including lodging, catering and transport)
No project management included

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Figure 15. Class D NZE Retrofit

Ashini CONSULTANTS

Project: House retrofit
Project Nu : 028-19011
Prepared by : Jean Larouche
Type : Existing building renovation
Location : Eastmain
Date : March 4th 2019
Revision 0

ID	Qty	Description	unit	PU	Material	Labor	Man-hours	Sub-total	Contingency Class B -10%	Contingency Class B 15%	Notes
1	0	Water input	gl	2 750,00 $	- $	- $	-	- $	- $	- $	
2	145,00	Excavation/ embankment	m3	31,50 $	3 197,25 $	1 370,25 $	20	4 567,50 $	4 110,75 $	5 252,63 $	Mat included excavation equipement
3	0	**Foundations**	m3		- $	17 064,00 $	244	17 064,00 $	15 357,60 $	19 623,60 $	Concrete : 300$/m3, mat includes pump
3,1	0	Main footing	m3	1 325,00 $	- $	- $	-	- $	- $	- $	
3,2	0	Isolated footing	m3	1 050,00 $	- $	- $	-	- $	- $	- $	
3,3	1264	Isolated fundation walls	sq2	13,50 $	- $	- $	-	- $	- $	- $	
4	2362,5	**Building exterior walls**	sq2								
4,1	2362,5	Structure	sq2	10,75 $	12 781,13 $	12 615,75 $	180	25 396,88 $	22 857,19 $	29 206,41 $	
4,2	2367,5	Insulation	sq2	4,20 $	4 299,75 $	5 622,75 $	80	9 922,50 $	8 930,25 $	11 410,88 $	
4,3	2367,5	Outdoor siding (Canexel)	sq2	15,50 $	7 512,75 $	29 106,00 $	416	36 618,75 $	32 956,88 $	42 111,56 $	
4,4	1	Doors and windows (triple glasses)	gl	26 250,00 $	21 000,00 $	5 250,00 $	75	26 250,00 $	23 625,00 $	30 187,50 $	1 bid for windows
5	1700	**Roof**	sq2								
5,1	1700	Structure	sq2	12,50 $	7 293,00 $	13 957,00 $	199	21 250,00 $	19 125,00 $	24 437,50 $	Includes lifting equipment
5,2	1485	Insulation	sq2	6,75 $	4 380,75 $	5 643,00 $	81	10 023,75 $	9 021,38 $	11 527,31 $	
5,3	1700	Roofing	sq2	4,15 $	1 445,00 $	5 610,00 $	80	7 055,00 $	6 349,50 $	8 113,25 $	
5,4	1700	Finition	sq2	2,75 $	1 241,00 $	3 434,00 $	49	4 675,00 $	4 207,50 $	5 376,25 $	
6	1462,5	**Concrete slab**	sq2								
6,1	1134	Insulation	sq2	5,75 $	2 642,22 $	3 878,28 $	55	6 520,50 $	5 868,45 $	7 498,58 $	
6,2	1134	Concrete and finition	sq2	7,25 $	3 144,72 $	5 076,78 $	73	8 221,50 $	7 399,35 $	9 454,73 $	Mat price includes pump
				Material from Rona :	44 740,32 $						
				Total :	**68 937,57 $**	**108 627,81 $**	**1 552**	**177 565,38 $**	**159 808,84 $**	**204 200,18 $**	
			Building area	1134	sq2		Cost by sq2:	$ 156,58	$ 140,92	$ 180,07	

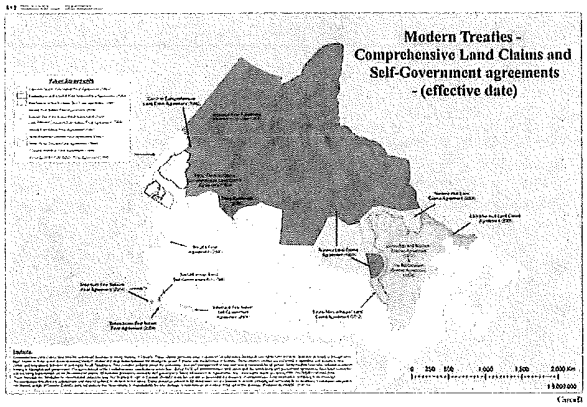
Assumptions
Materials costs by Rona from edmonton contractor estimate (transport to Eastmain included)
Labor: 60% of the workers are locals (50$/h) and 40% of the workers are externals (100$/h including lodging, catering and transport)
No project management included

CHAPTER 9: IMPLEMENTATION PHASE

Duty to Consult with Indigenous groups

The CNE is an Indigenous group, having recognized and constitutionally-protected land rights in Eeyou Istchee, the territory where it will carry out its Net-Zero Housing Program. As such, the CNE is not subject to the duty to consult.

Figure 16. Treaties Map



Modern Treaty Obligations

The CNE is one of the signatories to the James Bay and Northern Quebec Agreement, Canada's first modern-day treaty. The CNE therefore does not have any obligations, in the context of its NZE program, under federal or provincial legislation with respect to Indigenous treaty rights.

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Community Employment Benefit (CEB)

If selected as the $5M category winner of the Smart Cities Challenge, the CNE will report on the Community Employment Benefit for Indigenous people. Its NZE program is inclusive in that it offers employment and business opportunities to youth, women and apprentices for skilled trades. Tendering for work that will be carried out under the NZE program will prioritise small, local Indigenous business and tradespeople.

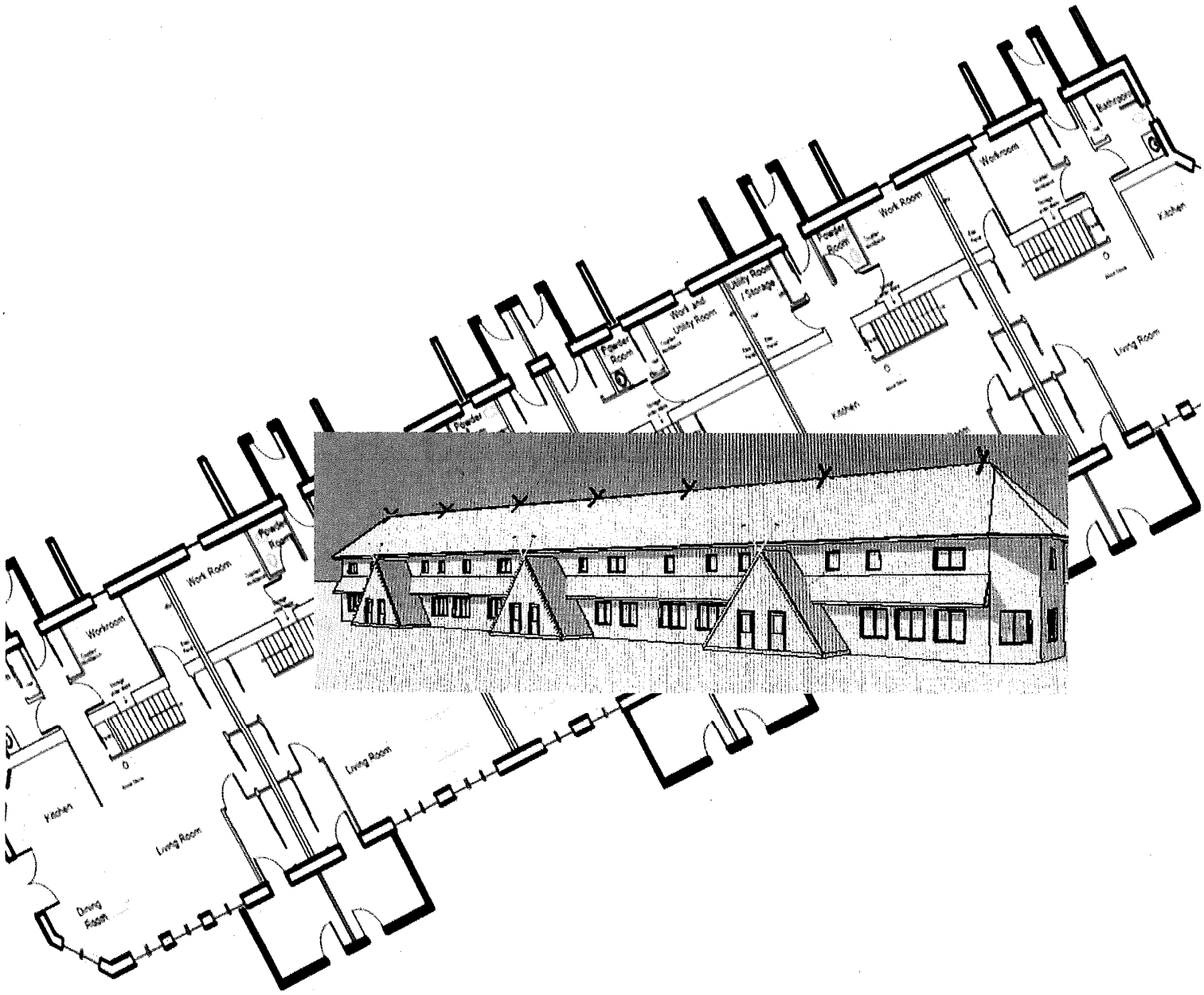
Already the CNE has hired 3 youth under a work placement program to gain experience with the project management team and McGill University. The CNE will engage other youth as part of the trades training initiative under the NZE program. We will also target employment for youth with disabilities.

Part of our project management team includes an Indigenous-owned and operated engineering firm. The CNE will support Indigenous businesses as part of our procurement process.

Climate Lens Assessment (CLA)

Climate Lens Assessment is not applicable to CNE's project due to it being within the $5M category.

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THE SMART CITIES CHALLENGE

THE CREE NATION OF EASTMAIN'S

NET ZERO ENERGY HOUSING PROGRAM

CREE NATION OF EASTMAIN

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EXECUTIVE SUMMARY

Improving Community well-being. This statement highlights the challenge that the CNE intends to overcome with its Net-Zero Energy Housing Program.

Housing is essential for a healthy community and, like many Indigenous communities, the CNE has a critical shortage of housing for its members. The lack of adequate housing in Indigenous communities results in overcrowding, a factor in many of the health and social issues inflicting our communities.

In fact, the quality of housing in Indigenous communities has been a hot topic in Canadian news for years, and even recently. The effects of mould and inadequate housing are being linked in the media to serious health conditions and even the deaths of Elders and children. It is clear that housing remains forefront and centre for Canadians, and especially for Indigenous communities.

Through its Net-Zero Energy (NZE) Housing Program, the CNE will construct quality, energy-efficient homes that are affordable for its members. The NZE Housing Program consists of new builds and retrofitting of existing homes. An inventory of single-family homes, an Accessible House and Multi-Client Six-Plexes (Six-Plex) will ensure that housing responds to members' needs and financial capacity.

The CNE vision is clear – create an affordable, resilient, energy-efficient housing program that offers rental and private homeownership opportunities. Substantial performance measurement activities will enable the CNE to determine the success of its NZE program and ensure that milestones and deliverables are on time and on budget.

By establishing an experienced and dedicated project management team, the CNE has been able to develop a comprehensive project implementation plan aimed at achieving success. The CNE will introduce smart technologies and net-zero building techniques to collect quantitative data on the net-zero performance of the houses built and retrofitted under its NZE program. In addition, the CNE will collect qualitative data on residents' housing experiences.

By having a strong, well-established governance system auditable to an ISO/IMS, the CNE will effectively manage program implementation to ensure outcomes are achieved through effective stakeholder engagement, strong leadership and risk-based thinking. The CNE governance framework is grounded in openness, transparency and accountability.

Throughout the development of its NZE program, the CNE has continuously engaged with stakeholders to lead to better decisions and ensure a holistic approach is taken in addressing the housing crisis in Eastmain.

Because of the nature of the NZE program, the CNE will ensure that personal information collected from its members is used, stored and disclosed in accordance with the *Personal Information Protection and Electronic Data Act*. Information collected under the NZE program monitoring and research activities will be anonymized prior to any disclosure.

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The CNE undertook extensive costing exercises that has already yielded savings for our NZE program. The project management team aggressively sought funding, and will continue to do so, in order to supplement the SCC prize money to ensure the viability of the NZE program with minimum financial risk. The CNE has committed to matching the prize money if selected as the $5M category winner.

The aforementioned elements are aimed at bringing success and sustainability to the NZE program. Through collaborations with academia, industry experts and government agencies, the CNE is capable of offering not just housing to its members, but a better quality of life. Initiatives like training, work experience and economic development opportunities will ensure a strong and viable future for the community.

Our NZE program was designed around scalability, transferability and replicability. The smart technologies used are commercially available, the governance structure is easily transferable to other Indigenous communities and the house designs and building techniques can be scaled to reflect the financial and technical capacity of other communities, taking into consideration their culture and traditions.

The CNE is an Indigenous community and therefore benefits from obligations generally on the federal Crown and provinces with respect to the duty to consult and modern treaty obligations. At the same time, the CNE has ensured that its NZE program is inclusive and leads to a better quality of life for youth, women, elders and people with disabilities.

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CHAPTER 1: VISION

The CNE Vision

The CNE is proud of its heritage. Its vision is that of a self-sufficient First Nation that is able to offer its members, and future generations, a better place to live and grow. This vision is confirmed in the CNE 2018-2021 strategic plan (*See Annex A*).

Our final proposal pursues the vision of improving the quality of life and well-being of our members and our community by establishing a Net-Zero Energy (NZE) Housing Program to respond to the critical housing shortage. Housing is inarguably the foundation of a strong, healthy community. The lack of adequate housing in Eastmain, and other Indigenous communities, is a significant factor in many of the health and social issues inflicting our communities.

Housing issues are rooted in the history of our communities. The Cree Nation of Eastmain's vision is therefore tied to its past.

Eastmain has evolved from its origins as the Hudson Bay trading post headquarters for the east coast of James Bay. In the early 18th century, the Cree people began to settle in the area and the community of Eastmain was established. In 1762, Eastmain was relocated to the south shore of the Eastmain River at the mouth of James Bay to make it more accessible. Notwithstanding the Crees' long occupation of the region and the community, it was only in 1962 that the *Lands and Forests Act* (RSQ c T-9) reserved the lands for the exclusive use of the Crees of Eastmain.

In the 1960s and 70s, the Crees of James Bay (Eeyou Istchee) joined forces to oppose Quebec's James Bay Hydroelectric Project. From this concerted effort came the first modern day treaty, the James Bay and Northern Quebec Agreement. Since then, the Crees of Eeyou Istchee have entered into a number of other treaties with Canada, Quebec and Hydro Quebec. Most recently, the *Agreement on Cree Nation Governance Between the Crees of Eeyou Istchee and the Government of Canada* which gives the Cree significant powers of self-government.

Today, Eastmain has a population of approximately 850 people and is the headquarters of the Cree Regional Trappers Association. Much of the economy is based on local and regional government employment, but there are businesses operating in accommodation and food services, retail trade and construction.

Eastmain is therefore a thriving community with strong ties to its traditions.

Initially, like many Indigenous communities, the CNE housing program offered only social housing constructed with federal funding. Housing under this program must be modest and low-cost. However, the housing designs do not satisfy the cultural and social needs of the occupants and the construction techniques relied upon are often not well-suited to northern climates. Consequently, frequent maintenance is needed to ensure the housing units functionality at a cost that undermines their initial affordability.

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The social housing model is no longer sustainable and does not allow the CNE to satisfy the ever-growing demand for housing. This model further fails to reflect the economic realities of Eastmain and other Indigenous communities where successful business endeavours, government employment and traditional lifestyles co-exist, creating different levels of financial capacity.

In an effort to move away from this model and find new solutions to the housing shortage, CNE is changing its housing program. By offering other solutions, such as private homeownership and rent-to-own, the CNE can ensure that social housing is allocated to those who have limited financial capacity. The success of these alternatives to social housing depend upon the CNE overcoming the challenge of creating affordable and sustainable housing options.

Consequently, the CNE developed the Net-Zero Energy (NZE) Housing Program. This program addressed the challenge of building affordable housing that is also affordable to operate. Cree Nation of Eastmain's NZE program aims to offer culturally-appropriate designs, significant reductions in operating costs and enhanced resilience and durability while building community capacity and creating new local employment and economic development opportunities.

Since first conceived, the CNENZE program has seen some changes as a result of our ongoing efforts to design a program that is responsive to the CNE housing needs while reflecting our capacity. As a result, the projects in year 1 will be carried out as pilot projects and will be limited to the construction of an Accessible House and the retrofit of an existing house. This variation was driven by (a) restrictions on bulk buying construction materials before storage is available, (b) the start date for local assembly of building components, and (c) to allow for a true inventorying and costing of construction materials required for the NZE program.

It is noteworthy that the NZE program not only responds to regional directives, it also supports the Government of Canada initiative to develop a "net-zero energy ready" building standard and a model code guiding energy efficiency improvements during renovations. Government of Canada intends to have these codes adopted by the provinces and territories by 2030[1]. The Cree Nation of Eastmain's NZE program will put it at the forefront of this initiative, making it an Indigenous leader in addressing the challenges of environmental sustainability and climate change.

Outcomes

Although housing is but one issue facing Indigenous communities like Eastmain, it is a common underlying factor of many of the social and health issues. Housing that is durable, appealing and comfortable is the foundation of a strong and healthy community which is the Cree Nation of Eastmain's long-term goal. Therefore, the outcome is to establish an inventory of energy-efficient, resilient housing to respond to the needs of its members and residents. The houses must be comfortable, reflective of the Cree lifestyle and able to withstand the northern climate.

[1] See: https://www.canada.ca/en/services/environment/weather/climatechange/climate-action/federal-actions-clean-growth-economy/homes-buildings.html

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Over the next 6 years, the first being a pilot year, the CNE plans to build 5 new single-family homes, 5 Six-Plexes and retrofit 25 existing homes. This initial inventory will offer private homeownership, rent-to-own and rental options, making housing accessible to everyone.

The NZE program is designed to encourage capacity building and a sense of community. By fostering a sense of pride in the community and Cree culture, our NZE program will become a model for Indigenous communities across Canada.

Reflects CNE's needs

The NZE program is reflective of the true needs of the CNE and its residents. The housing shortage facing Indigenous communities is undeniable and cannot be ignored.

Numerous studies have drawn attention to the enormity of housing issues in the North including the inadequate supply, poor quality construction, poor affordability and designs that address neither the rigorous climate of Canada's north nor the cultural realities of its Indigenous peoples. As noted by Andy Moorhouse, past President of the Kativik Municipal Housing Bureau, when speaking about the reality of remote northern Indigenous communities in a 2011 address, "Housing is not the only issue, but all issues relate to housing"[2].

In its report on "On-Reserve Housing and Infrastructure: Recommendations for Change", the Senate Committee on Housing highlighted "the need to examine current initiatives to addressing housing on reserve". Citing one example of the challenges, the committee noted that even though $300 million had been set aside by the federal government in 2008 for the First Nations Market Housing Fund, which was expected to result in 25,000 new home builds in 10 years, by May 2015 only 99 homes had been built. The Senate noted that new approaches to housing, including innovative designs, alternative programs and new methods of implementation are needed. Northern research has also identified that Euro-Canadian forms of housing are incompatible with the social structure of Indigenous families[3].

CNE's NZE housing program is relevant and responsive to the needs of Eastmain. As of February 2019, the CNE had a shortfall of over fifty housing units, with the demand for two-bedroom units accounting for more than 50% of the current needs.

[2] If Not Now, When: Addressing the On-going Inuit Housing Crisis in Canada.

[3] *Examining the impact of Euro-Canadian architecture on Inuit families living in Arctic Canada*, Dr. Peter Dawson, University of Calgary, 2003

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Adding to the ever-present concerns around housing shortages and affordability are the issues of energy efficiency, energy security and community resilience. Remote communities like Eastmain are subject to periodic power blackouts that can extend for days at a time. During power outages in Eastmain, most houses which were built to meet the "minimum" requirements of the building code, will freeze up within hours. Moreover, these same houses use considerably more energy than houses in southern Canadian cities, adding to the high cost of home operation while also contributing to climate change.

The Eastmain Cree are attached to their culture and regularly practice traditional activities. In fact, most families rely on hunting, fishing and trapping to supplement their diet. While in the bush practicing their traditional activities, the homes are unsupervised, making them vulnerable to the outcomes of power outages. The construction techniques and smart technologies proposed in the NZE program will significantly reduce these vulnerabilities.

Ambitious and Achievable

The proposal is not only ambitious, but it is realistically achievable. Less than 50 years ago, the CNE had no road access and very little infrastructure supporting its community. Today, Eastmain is a thriving community with an airport, arena, sports complex, schools, health clinic and stores. The CNE provides all the usual municipal services to its members.

The CNE currently has a need for 52 housing units that it cannot satisfy. In a community of 255 homes this is significant. The CNE plans to build 35 new housing units and retrofit 25 homes and buildings over the next six years. This amounts to improving the backlog by 67%. The scale of the proposed program is enormous considering the size and population of Eastmain.

The NZE program is ambitious in that it proposes to tackle a problem that is not simply local but extends to Indigenous communities across Canada. Housing is conceivably the biggest issue facing Indigenous communities which must deal with significant housing shortages and unsuitable construction materials and techniques.

In order to address the significant housing backlog, the CNE plans to implement its NZE housing program. The NZE program is designed to be sustainable because creating an affordable housing scheme doesn't only mean controlling the costs of construction, but also controlling the costs of operating and maintaining homes.

The Cree's connection to family and land are factors that must be at the forefront of any solution if the CNE initiative is to be successful and sustainable. By building new multi-family and single-family homes, and retrofit existing homes, the CNE will be able to offer its residents better quality housing options that respond to their needs and financial capacity.

The CNE has the structure and capacity to implement and achieve success of its NZE program. It has an economic development corporation, Wabannutao Eeyou Development Corporation, and a construction company, Stajune Construction Inc., that are often involved in local community construction projects. The CNE will use both companies with a view to maximize local employment, entrepreneurship and housing affordability. It

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Table 1 – CNE Housing Needs: Past and Future

	Past 5 Years				
	2019	2018	2017	2016	2015
Backlog per year	52	51	40	36	28

	Projection over 6-year period*					
	Current	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Housing Stock	255	256	263	270	277	284	290
New NZE Construction	total 35 ✓	1	7	7	7	7	6
Will reduce backlog to		51	44	37	30	23	17

**Note: It is expected that the housing needs will grow over the next few years as our younger generation ages.*

As early as 2000, the Cree Naskapi Commission has emphasized the need to resolve the housing shortage and substandard housing in the Cree communities. Eastmain's NZE program is also in line with Government of Canada's national housing strategy which recognizes the housing crisis facing Indigenous communities and the need to develop new approaches that include increasing private homeownership opportunities, as well as the need to significantly improve the sustainability of housing in Indigenous communities.

Since 2017, the CNE has undertaken significant community engagement to ensure that its NZE housing program is meaningful for its members. In June 2017, the CNE held workshops, conducted home visits and consulted with members with a view to collecting information on house designs of different housing types. At the September 2017 annual general assembly, the CNE engaged in a broader discussion with its members for ideas on how to improve housing. These discussions have been complemented by consultations with service providers including health care and the fire department to ensure a comprehensive approach to addressing the housing shortage and ensuring a solution that is culturally-appropriate and reflective of the Cree way of life.

In addition, the CNE held its first Housing Forum in February 2018. The Housing Forum allowed CNE members to voice their views on the CNE housing needs and the Smart City Challenge proposal. The members contributed to the design of a culturally appropriate NZE multi-unit model home. The information and ideas obtained at the workshops, home visits and annual general assemblies led to the "Cree Café" where smaller focus groups have explored the issues and ideas generated during the broader consultative process. Through its Cree Cafés, the CNE has developed design innovations and established a means for ongoing community consultation on the NZE program.

In addition to high construction costs, the high cost of operation and maintenance remains a significant deterrent to home ownership and the development of home ownership programs in First Nations communities, including Eastmain. New home owners are often challenged to keep up with the high operating costs of their homes, while current social housing programs significantly subsidize operating costs. This deters potential buyers from investing into home ownership, remaining siloed into lifelong housing rental.

should be noted that Wabannutao Eeyou Development Corporation and Stajune Construction are in the process of restructuring to improve efficiencies for the implementation of our NZE program.

The CNE recognizes that the scope of its NZE program is such that it will need partners who can support and complement its efforts. The CNE carried out considerable consultation with community members and with experts in the areas pertaining to residential construction, construction standards and techniques and net-zero energy technologies.

The CNE identified potential partners because it recognizes that a program this ambitious cannot be undertaken alone. The CNE has established relationships with academia, businesses and government agencies and organizations to ensure the success of its NZE program. Where appropriate, the CNE has secured commitments from its partners and is developing formal agreements relating to the role that these partners will play in the program. These partners will all contribute to ensuring and measuring the success of the program.

In addition, the CNE has engaged with the supply chain. By sharing key information with suppliers, the CNE has been able to start tracking the actual costs of the NZE program. This is just the start of the Cree Nation of Eastmain's efforts to establish a resource management system aimed at enhancing accountability and responsibility.

The CNE has put significant effort and considered all its options to resolve the housing shortage and create better-built, energy-efficient homes. Creating an NZE community is therefore very ambitious but achievable.

Meaningful

The CNENZE program will realize outcomes that are meaningful for residents of Eastmain by constructing new NZE homes and retrofitting existing homes. The new homes will allow CNE members to enter the housing market at different economic levels while ensuring that members who rely on social housing are provided homes that can withstand the northern climate while offering a comfortable living environment.

CNE members have had a say in the NZE program though community consultation sessions and workshops at which they received information about NZE program and smart technologies. More importantly, our members played an important role in shaping the housing designs and the technologies that will be used in the NZE program, ensuring community-wide acceptance and approval.

The lack of adequate housing in Indigenous communities has resulted in overcrowding which is an important factor in many of the health and social issues affecting these communities. The current housing model and funding formulas in the on-reserve social housing program are not a sustainable solution to the housing shortage. These have resulted in the widespread use of housing designs that do not meet the cultural and social needs of occupants and construction techniques and standards that are often not well-suited to northern climates.

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Well-suited to Smart Cities Approach

The CNE NZE program is grounded in the past and forward-looking in proposing an achievable solution to the longstanding housing shortage, making it well suited to the Smart Cities approach. The CNE has a community wide fiber optic infrastructure, making it ideal for a Smart Cities approach to creating a connected, energy-efficient community.

Significant collaboration with experts, suppliers and key stakeholders has enabled the CNE to design its NZE program. Academic partners have jumped on board to undertake studies of measurable outcomes like energy savings and generation and less tangible outcomes like the comfort and happiness of occupants of NZE homes. Suppliers and government agencies consider the NZE program proposed by the CNE as creating new opportunities for development and capacity-building in the North.

The NZE program embodies the Smart Cities approach by employing smart technologies and connectivity to ensure open, transparent, accountable and responsible government. CNE is implementing a combination of ISO Standards to put in place processes and standards to better serve its members and increase transparency and accountability. These efforts include creating policies and First Nation laws that establish guidelines, a framework and rules in discrete areas, including housing. Given the importance of housing to community well-being, evolving societal views and the ever-changing technical landscape in this sector, the CNE intends to continue the revision of its Housing Policy, a process started at its Housing Forum, where members were given an opportunity to voice concerns and put forward ideas to improve community housing.

The smart technologies to be used in establishing NZE homes will ensure that traditional practices are supported in modern homes. Occupants or the CNE can monitor homes even while in the bush to ensure that the home systems are properly functioning.

The data generated through smart technologies will allow for better decision-making by the CNE and empower residents to better control energy use. This data will also enable the CNE to adjust its NZE program to be more responsive to the needs of its members. More importantly, such data may facilitate discussions with public energy agencies on energy use and with Canada Mortgage and Housing Corporation on housing designs and construction materials for northern climates.

The CNENZE program is transferrable to other communities facing housing issues and looking to create a more sustainable, resilient housing program. Not only can the NZE program be shared with other communities, it can be scaled to reflect the needs and capacities of these communities. Furthermore, our NZE program is particularly responsive even for off-grid communities as it will decrease the energy load on the diesel-generated electricity grids, thereby reducing significantly greenhouse gas emissions.

Measurable

The smart technologies to be used in the construction and retrofitting of homes will permit detailed data collection relating to energy use and production. The CNE will leverage this

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data to make better decisions and ensure the NZE program attains its objectives. The data will also be used by the CNE and its partners to make improvements to the NZE program and measure its success.

In addition to monitoring the NZE program, a social research platform will be established to assess, over time, how the program is contributing to community well-being. Housing conditions are a well-recognized determinant of health. We will evaluate how the NZE program fosters a sense of well-being by (a) reducing overcrowding through the construction of new homes, (b) improving comfort and livability by retrofitting existing homes, (c) designing houses that meet the cultural and social needs of occupants, and (d) by offering a range of housing tenure.

This social research platform will also serve to document the opportunities, challenges and best practices for scaling the NZE housing program to other Indigenous communities across the country.

Progress toward Outcomes

Since first submitting its proposal, the CNE has continued in its efforts to implement its NZE program.

The CNE has conducted community consultations and obtained community support for the NZE program. With input from members, the CNE has developed housing models that reflect and complement Cree culture in their layout and design.

The CNE has conducted modelling exercises to ensure that the NZE homes can achieve net-zero energy status. Through this process, the CNE has identified the building system, levels of insulation, the types of windows, the size of solar energy component and the other technical requirements needed to achieve net-zero energy in Eastmain.

Finally, the CNE has obtained funding from Canada Mortgage and Housing Corporation to develop and implement the social research platform in collaboration with the Canada Research Chair in Housing, Community and Health at McGill University in Montreal.

Why Choose Us

The CNENZE program is concrete, measurable and transferable. This means that it aligns perfectly with Canada's declaration that housing in Indigenous communities is a government priority.

While NZE projects may not be considered innovative generally, establishing an NZE program in the North is innovative. Moreover, implementing a community-wide NZE program that includes multi-unit residential buildings has never been contemplated – until now. Implementing the NZE program as an opportunity for capacity-building also sets the CNENZE program apart and makes it innovative.

The CNE approach to the Indigenous community housing crisis makes our NZE program super-innovative. The CNE is addressing this holistically by bringing together community

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members, private sector actors, experts, public sector agencies and academia in order to find feasible solutions to creating affordable and resilient housing.

Much interest has been expressed in the CNE NZE program because it is aimed at a diverse clientele. Under our NZE program, the CNE is offering rental housing for low-income residents, rent-to-own and entry-level private homeownership. The designs give the CNE the flexibility of blending clientele for any combination in the Six-Plex and other housing options.

Unlike some proposals, the CNENZE program is relevant and responsive to the situation in many Indigenous communities across Canada. Creating an affordable, resilient housing program therefore also addresses a national problem, the critical housing shortage in Indigenous communities. The collection and analysis of pertinent data will allow the program to adapt accordingly to real quantifiable and qualifiable needs.

Our NZE program can be scaled to reflect the needs, financial constraints and capacities of other Indigenous communities across Canada. The program's scalability makes it easily transferable to other Indigenous and non-Indigenous communities as a solution to address housing shortages. Moreover, the program is designed to create economic development and capacity-building opportunities for Indigenous communities.

By designing a program that adheres to Smart City principles the CNE is setting the groundwork for a future of sustainable and durable housing for Indigenous communities that ensures openness, transparency and accountability at all levels. This means that members of these communities are involved in resolving the issues affecting their housing programs and informed of contracting and expenditures related to NZE homes.

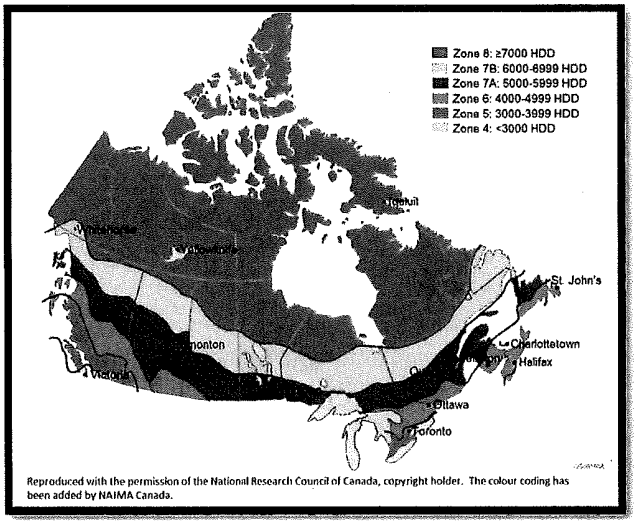
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CHAPTER 2: PERFORMANCE MEASUREMENT

Outcomes-based Performance Measurement Plan

Eastmain is located in Climate Zone 8 (Figure 1), the coldest climate zone in Canada.

Figure 1. Climate Zone Map



Its location and climate bring challenges to the CNE goal of creating a net-zero energy community. The collection and analysis of performance data relating to the NZE program is essential. Significant technical, social and costing data will be collected during the project. Technical data will be used to measure the performance of the homes constructed and retrofitted under the NZE program and will enable the CNE to identify shortcomings and take lessons-learned to make adjustments to the building systems and equipment accordingly. Social data will be used to measure the success and suitability of the designs selected for the NZE program and to make changes as may be needed to ensure the comfort and enjoyment of the occupants. Costing data will be used to first determine the actual itemized costs of construction and to build on efforts to reduce the cost of housing construction in Eastmain.

To address the wide range of housing issues in Eastmain, as part of the Smart Cities Challenge, the CNE will continue its transition from a social housing-based program to a market-based program. The primary criteria for determining housing types for construction will be financial capacity. This will also involve changing the underlying culture in Eastmain where social housing has been deeply inculcated.

The Eastmain NZE housing program is aimed at responding to the need for housing while inciting a shift in culture.

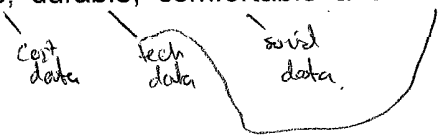
Links to Outcomes

The program will have three primary components: (a) the design and construction of a culturally-appropriate net-zero energy Six-Plexes, (b) the design and construction of a net-zero energy single-family homes, and (c) the net-zero energy retrofitting of existing homes in the community, all of which will be equipped with smart home technologies. These three components will constitute the "next generation" housing in Eastmain and will enhance social inclusiveness, by stimulating our local economy and safeguarding the health and environment of our community.

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Educating residents on the proper use and maintenance of housing will be a longer-term outcome of the CNE NZE program. Likewise, given the new housing policies and rules being implemented in Eeyou Istchee, the CNE must also find ways to inform suppliers and builders that wish to participate in residential construction in Eastmain of these policies and rules.

At the end of the NZE program, the CNE will have created a framework for the design, construction and operation of affordable, durable, comfortable and resilient net-zero energy houses in Northern communities.



Project Activities

Consultation

The CNE has carried out ongoing consultations on housing issues in the community through a range of initiatives including the Eastmain Annual General Assemblies, Cree Café's, design charrettes (integrated design workshops), site visits, meetings, the Eastmain Housing Forum and the Eastmain Builders Forum.

The first step to creating the NZE housing program involved engaging the community in the design of a culturally-appropriate NZE Six-Plex, consisting of 2 social housing units, 2 rent-to-own units, and 2 starter home ownership units. The CNE then consulted members on the design of an NZE single-family home prototype as a model for residents wishing to purchase their own home.

Through further consultation, that included the health and public safety sectors, the CNE designed other NZE housing prototypes to accommodate different needs, including a "Cree Elders House", an "Accessible House" and a starter house. Consultation with the health and public safety sectors also allowed the CNE to ensure that the designs and components of the Six-Plex, single-family homes and Accessible Houses provided a healthy, comfortable living environment that would also respond to the needs of the occupants.

The CNE also engaged with experienced net-energy zero builders who have worked on projects in northern communities. These builders, with other net-energy zero experts, brought a perspective and experience that enabled the CNE to establish the best building strategies, techniques and materials.

The amplitude of the CNENZE program and the goal of creating affordable housing called for engagement with local builders by the CNE and the Cree Nation Government. Local builders were given information on the NZE building concepts and program structures. More importantly, by engaging with the local builders, the CNE obtained their feedback on the proposed building systems and ensured that the building systems and technologies are feasible in Eastmain. This process has set a strong foundation for the integration of the NZE program, thereby ensuring its success in Eastmain.

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Analysis

Much analysis and consideration went into defining the parameters of the CNENZE housing program to ensure that it was feasible and responsive to the realities of the North.

McGill University presented at the Eeyou Mitchuap forum on its Nunavik housing study. This study provides baseline information that has been useful in the preliminary analysis of housing requirements and models and will continue to be useful in testing the results of the CNENZE program.

The CNE consulted different experts on net-zero energy building systems, materials, technologies and construction strategies. Through extensive energy modelling on the Six-Plex and Accessible House the CNE was able to determine the level of energy production that would make net-zero energy feasible in Eastmain. The CNE has calculated the amount of energy production required, including the size of solar array and the capacity of air source heat pumps needed to attain net-zero energy. The CNE has thus determined, in its climate, the combination of energy saving construction techniques and materials (wall systems, insulation levels, windows, etc.) with energy producing technologies (solar photovoltaics, air source heat pump) to successfully achieve net-zero energy.

Analysis will include the activities conducted after implementation of the NZE program. The CNENZE program will include establishing a detailed costing regime that will ensure Smart Cites Challenge funds are used to deliver affordable net-zero energy houses and retrofits with smart technologies within the community. The costing regime will include an in-depth analysis of the transportation costs incurred to bring construction materials to Eastmain. This analysis will enable the CNE to determine the impact of transportation on the overall cost of housing in northern, remote communities like Eastmain.

Pre-NZE Activities

The CNE carried out an assessment of its existing housing inventory to determine the amount and type of renovations required to improve the functionality of these homes. This assessment will permit the CNE to identify the houses that will be best suited for retrofitting to make them function at the net-energy zero level.

Following significant community consultation which enabled the CNE to identify the floor plans and designs, it was time to decide on construction timelines. In order to ensure the program's success, the CNE has chosen to start with a single-family home that will allow it to test its processes and construction techniques. This choice was also driven by the necessity for an Accessible House in the community to respond to the needs of a disabled member. The CNE conducted extensive energy modelling on the Accessible House to ensure that it could satisfy the net-energy zero performance standards.

NZE Program Activities

In 2019, the CNE will construct one single-family Accessible House and carry out one retrofit of an existing home as part of a pilot project. This will also serve as a prototype for Eastmain residents with disabilities. The CNE will have the opportunity to test the construction materials and the building system used in projects before proceeding with the construction of additional single-family homes, multi-unit housing and retrofits.

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These initial construction projects will be used to develop a detailed and comprehensive list of all the materials required for each of the net-zero energy housing projects – the Six-Plex, single-family home and net-zero retrofit. The CNE will also create a detailed breakdown of projected labor costs for each stage of the construction process. Proper tracking and recording of the materials and labour required for each project will ensure that the NZE program is sustainable, affordable and transparent.

An in-depth post-construction evaluation will be carried out that includes a cost comparative analysis of the projected material and labor costs with those of the detailed costs that were tracked during the construction process. This evaluation and comparative analysis, combined with quantitative data obtained from Hydro-Quebec meters and the Concordia University study, will allow the CNE to make improvements aimed at ensuring the performance of the net-zero energy building system. Lessons learned from the construction of the Accessible House will be used and scaled to the Six-Plex. From its experience during the pilot project phase, the CNE will select the materials for the construction of the Six-Plex and future single-family homes.

The CNE has already identified transportation times as a significant factor in project delays and costs, especially in remote communities, as well as the inability to store enough construction materials on site to ensure continuity of work on projects. To address this issue, in 2019, the CNE will construct or rehabilitate a facility where construction materials can be stored and building components can be assembled. This is a significant change in how construction projects are usually managed in Eastmain where materials are purchased only when construction is to start, with delivery occurring much later, leading to work stoppage when supplies or materials run out as well as delays in starting construction. By having a storage facility on-site, the CNE can time its purchasing to get a better price on materials, buy in bulk, and be in a position to commence construction immediately. This approach will also permit the CNE to maintain and control an inventory, reduce wastage and prevent the deterioration of materials.

In 2020, the CNE will construct a single-family home and one Six-Plex. In addition, the CNE will retrofit four existing residential units. To retrofit existing homes to net-zero energy standards, the CNE will incorporate a super energy-efficient "wall panel system", in conjunction with construction techniques that will enhance the energy efficiency of foundations and roofs.

Keeping in mind the goal of building a strong community, the NZE program includes various opportunities for capacity-building and economic development.

Timelines and Deliverables

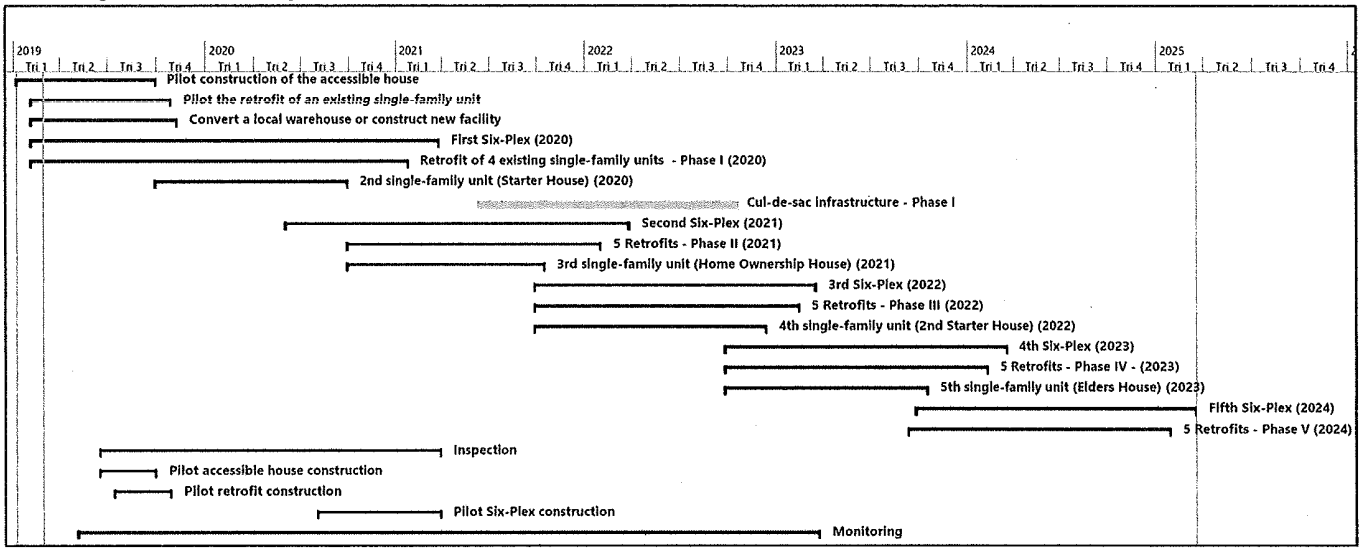
Our NZE program is a multi-year, multi-phase project during which the CNE will construct single-family homes and multi-unit buildings and retrofit existing homes. In year 1, 2019, the CNE will construct, as part of a pilot project, an NZE single-family Accessible House and retro one existing home. In the second year, the CNE will build one NZE Six-Plex and one single-family home and will carry out NZE retrofitting of four homes. In 2021, and for

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all the subsequent years, the CNE plans to construct one Six-Plex and one single-family home, except in the last year, and carry out 5 retrofits following the 2020 schedule.

The below tables set out the timelines for the NZE program.

Figure 2. 2019 Project Timelines



Payment Schedule

The CNE has based the payment schedule on the above timelines. The payment schedule is intended to reflect the amounts needed to successfully complete the activities within the established timelines.

Payment Schedule

With these and the projected construction costs, training costs and other related costs, the CNE has established the following payment schedule for the Smart Cities Challenge prize money that is reasonable and rational.

Table 2 – Payment Schedule

Year Ended	Year Ended	Year Ended	Year Ended	Year Ended	Year Ended	Total
31-Mar-20	31-Mar-21	31-Mar-22	31-Mar-23	31-Mar-24	31-Mar-25	
Proforma	Proforma	Proforma	Proforma	Proforma	Proforma	
$517,285	$1,160,551	$1,225,331	$1,063,633	$1,033,200	-	**$5,000,000**

Quantitative and Qualitative Indicators

The CNE has established a collaborative relationship with Concordia University and McGill University for the purpose of permitting the collection and analysis of quantitative

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and qualitative data. This data, which will allow us to measure the success of the NZE program, includes

- air quality
- thermal comfort through
  - ❖ objective measurements on energy efficiency
  - ❖ resident's self-reported assessments of thermal comfort
- energy consumption
- energy production
- Potential moisture issues in building components
- decay heat loss
- energy use trends
- well-being, based on indicators like
  - ❖ satisfaction with new home designs and retrofitted homes
  - ❖ thermal comfort
  - ❖ sense of home
  - ❖ quality of life
  - ❖ social inclusion, including socioeconomic indicators

Quantitative Data Measurement

The technologies to be implemented in this project are innovative and new to the region. The performance data to be collected is invaluable to validate their (a) application and (b) long-term performance, and to (c) improve the design, construction and operation of net-zero energy homes in northern regions.

Field data to be collected will be used to determine the (a) actual net-zero energy status of the homes, and (b) understand occupants' interaction with and operation of net-zero energy homes (like the set-points of indoor temperature, operation of HRV and air source heat pumps, window use, etc.). This data on indoor environmental quality will also be used in the qualitative study to assess the well-being of occupants with respect to the physical environment.

Qualitative Data Measurement

McGill University will conduct surveys and group meetings and attend Cree Cafés to collect information relating to occupants' experience in net-zero energy homes and retrofitted homes. The data will measure, amongst others, the (a) level of satisfaction with home designs and layouts, (b) operational functions, (c) compatibility with Cree culture and (d) pride in ownership.

Energy Modelling

The CNE will carry out detailed comprehensive energy modelling of the single-family home, the Six-Plex and the net-zero energy retrofits using Integrated Environmental

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Solutions (IES) or Energy Plus systems and drawing upon the lessons-learned during the construction of the Accessible House. The energy modelling will consider the effects of (a) night-time free cooling, (b) crawl space thermal mass and (b) shading to eliminate or reduce the use of air-conditioning, and provide recommendations aimed at improving the resiliency of the net-zero energy homes constructed in Eastmain.

The activities carried out during the comprehensive energy-modelling will include

- energy modelling based on the actual designs
- comparison of the energy-modelling results to HOT2000 software results
- optimization of the passive design and integration of the proposed technologies
- calibration of the comprehensive energy modelling with the field monitoring data collected on the Accessible House to optimize the design and construction of NZE homes
- hygrothermal modelling using the software WUFI Pro, calibrated with field measurements, that will be used to design alternative moisture-resistant envelope assemblies for net-zero energy homes in other climatic regions.

Monitoring, Reporting and Evaluation

Monitoring

The CNE and its partners, Concordia University and McGill University, will carry out various monitoring activities that will enable them to ascertain the success of the NZE program.

The sensors installed in the homes will collect important data that will be communicated through the battery operated dataloggers to a web-connected computer managed by the Cree Nation of Eastmain's Housing Department. The data will then be anonymized before uploading to an analytical website where it can be analysed by Concordia University. In addition, Concordia University will conduct quantitative studies on the air quality and energy consumption of a sampling of each of the housing prototypes constructed under the NZE program and the net-zero energy retrofit homes.

McGill University will analyse occupants' experience in the NZE homes and retrofitted homes. The well-being of the occupants will be measured and monitored over time using a range of indicators as described in the previous section. Data will be collected each year, using survey questionnaires administered to all Eastmain residents. This process will allow McGill University to monitor any change in the sense of well-being over time for Eastmain residents who move into NZE homes or whose homes are retrofitted and compare this to those residents whose housing situation does not change.

Smart tech

Given that smart meters have been installed on most homes, the CNE will seek to obtain quantitative information from Hydro-Québec respecting the energy consumption of each home. Using baseline data on non-NZE homes, the CNE will be able to determine if the NZE program is achieving its objectives and measure this achievement.

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Controlling the costs and timelines for constructing NZE homes requires consistent monitoring. As part of its NZE program, the CNE will establish a supply management system. This system will enable better monitoring and control of construction materials and their costs, including the transportation costs, as well as ensuring timely ordering to avoid delays.

Field Monitoring

Field monitoring will enable the CNE to identify any deficiencies in the program and ensure that the lessons learned through monitoring are applied to the NZE program. This will ensure that the NZE program is constantly adapting and improving to correct those deficiencies identified, if any, and responding to the needs of the community.

The monitoring protocol developed in year one of the NZE program will be applied to the construction and retrofitting projects in subsequent years. In year one, the Accessible House, scheduled to be completed by September 2019, will be monitored. The data collected through monitoring will be used to validate the design and construction techniques used, correct any issues, and incorporate design alterations to make improvements to the building's performance. For housing projects constructed in subsequent years, a similar data collection plan would be implemented for performance comparisons. Field monitoring will include:

- hygrothermal performance of the building envelope to ensure durability
- indoor environmental quality including
  - indoor air quality
  - thermal conditions
- energy performance including end energy use of
  - HVAC equipment
  - lighting
  - appliances
  - any other equipment
- energy generation of photovoltaic array

Concordia University will visit Eastmain twice during each construction season. The first visit will take place after the framing and roofing have been completed to install sensors and dataloggers, conduct blower door tests and seal any openings in the building envelope. Once construction is substantially completed, Concordia University will return to Eastmain to install energy monitoring equipment on the different systems, ensure the proper functioning of the sensors previously installed and conduct a second blower door test.

Hygrothermal Performance

The hygrothermal conditions, including the relative humidity and temperature (RH/T), of the envelope assemblies such as the walls, roof, attic and crawl space will be monitored. This data will be used to assess the risk of moisture-damage arising from condensation,

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decay and mould growth. An on-site weather station will be installed to monitor the wind speed, wind direction, rainfall intensity and global solar radiation. The weather station data will be used to correlate the hygrothermal performance and energy consumption and production of the NZE homes with local weather data for field data analysis and model validation.

Indoor thermal conditions and CO_2

RH/T and CO_2 sensors will be installed in indoor spaces to monitor thermal conditions and indoor air quality, thus enabling the CNE to confirm that indoor air quality standards are being met in the NZE homes and retrofits. This information will also be used to assess performance of the HRV system and determine if it is delivering sufficient ventilation to the housing units. Indoor RH conditions when combined with temperature data, will be used to assess thermal comfort. The RH data will also be used to determine the moisture loads for hygrothermal modeling to evaluate the resiliency of the NZE homes.

Energy Monitoring

Understanding and evaluating energy use and production in NZE homes is paramount to successfully achieving high performance and annual net-zero energy use. Both energy consumption and production patterns will be monitored. Monitoring will measure

- energy consumed by discrete building systems will be monitored, including
  - the air source heat pump and ducted mini-split (*Heating*)
  - ventilation fans
- appliances, including
  - stove
  - dishwasher
  - washer
  - dryer
- plug loads and lighting (*other than those attached to building systems and appliances*)
- Heat Recovery Ventilator (HRV), including
  - temperature conditions on all 4 sides of the HRV to calculate efficiency
  - temperature readings at exhaust inlet/outlet and supply inlet/outlet
  - air flow rates
- electricity produced by the solar PV array

The monitoring protocol and modeling strategies developed during the NZE program can be implemented in other northern communities, including remote, northern off-grid communities, to investigate options for the design, construction and technologies of net-zero energy homes. The protocol will also be useful for developing the framework/guide for creating successful, affordable and resilient net-energy zero housing.

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Risk Management

Identification of Risks

Table 3 – Performance Measurement Risks and Mitigation Strategies

Risks	Preventive Measures	Corrective Measures
Power loss to data loggers	Install data loggers with a battery backup and regularly verify power	Replace battery
Loss of internet connection		Data collected from sensors will be stored in a local computer until connection is restored and then will be transferred*
Faulty sensors	Test sensors prior to installation and after installation to ensure proper functioning and accuracy	Replace faulty sensors
Power loss to data collection computer	Use a battery power supply and an uninterrupted power supply (UPS)	Use backup Laptop computer Reboot computer when power is restored*
Data collection program crashes	A script has been written to force laptops to automatically reboot at certain intervals to ensure performance	Laptop will be restarted manually if necessary*

** On-site support is available in Eastmain allowing remote troubleshooting*

CHAPTER 3: PROJECT MANAGEMENT

The CNE has put significant effort into establishing a project management framework that will cover all phases of the NZE program. From identifying resources and needs to develop resources locally, to identifying the accounting, monitoring and reporting methods the project management plan proposed by the CNE will ensure the success of our NZE program.

To be long-term, the NZE program must look to the future and find ways to bind the community to the program. The CNE therefore established partnerships aimed at building capacity locally in the trades and specialized fields. This will guarantee success of our NZE program as Eastmain becomes more self-sufficient and its residents have opportunities to grow and create better lives for themselves and their families.

Project Scope and Scheduling

Project Scope

The NZE program consists of several projects and phases. Starting with the construction of a net-zero energy Accessible House and NZE retrofit. In support of this program, the CNE will establish a warehousing and inventory-costing system. In the subsequent years, the CNE will add on projects in a carefully thought-out sequence, that will include an Elders House and Private Homeownership Houses.

In preparation of the NZE retrofit project, the CNE has availed itself of an Indigenous Services Canada initiative to carry out an inspection and full-scale assessment of 24 existing houses in Eastmain. The inspection will include an estimate of the costs of

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renovation and an appraisal of the house. The data obtained from this will assist the CNE in identifying the houses to be retrofitted under the NZE retrofit program.

The NZE program also consists of ancillary projects that will support the program. These include the construction or rehabilitation of a facility for warehousing construction materials and assembling building components. This facility will enable capacity-building and create employment and economic development opportunities for the residents of Eastmain, which in turn will pave the way toward creating a strong, healthy community.

Resources Assessment

The CNE has the human, material and financial resources needed to make its NZE program a success. By phasing in the projects to be completed as part of the NZE program, the CNE will also ensure that it has the experience and capacity for each phase. This will also give it time to create capacity where needed.

Table 4 – Resource Assessment

Workforce Capacity		
The CNE has the human, material and financial resources needed to make its NZE program a success. CNE's construction company, Stajune Construction Inc., has experience carrying out large and smaller scale projects in Eastmain. An inventory of workforce resources has allowed the CNE to identify lacunae in the community and the areas where capacity-building must be focussed. In the interim, there are specialized tradespeople in other Cree communities and nearby Quebec cities who are eager to work on the pilot projects, while the CNE builds up its local capacity.		
Project management capacity	Experienced project manager	
	Housing specialist	
	Design consultant	
	Civil engineer	
	Chartered Accountant	
Trades capacity	**Trades**	**Quantity**
	Foreman	3
	Carpenters	21
	Machinery operator	16
	Plumber	0
	Electrician	0
	HVAC	0
Infrastructure readiness		
The CNE has **30 fully serviced lots ready** for new NZE homes. Eastmain has a **complete fiber optic infrastructure** throughout the community. This will enable long-term data monitoring and residents' access to the information obtained through the NZE program. There are local **warehouse facilities** where construction materials can be stored and building components assembled of. The CNE plans **to build or to renovate a warehousing facility** to store construction materials and assemble building components.		

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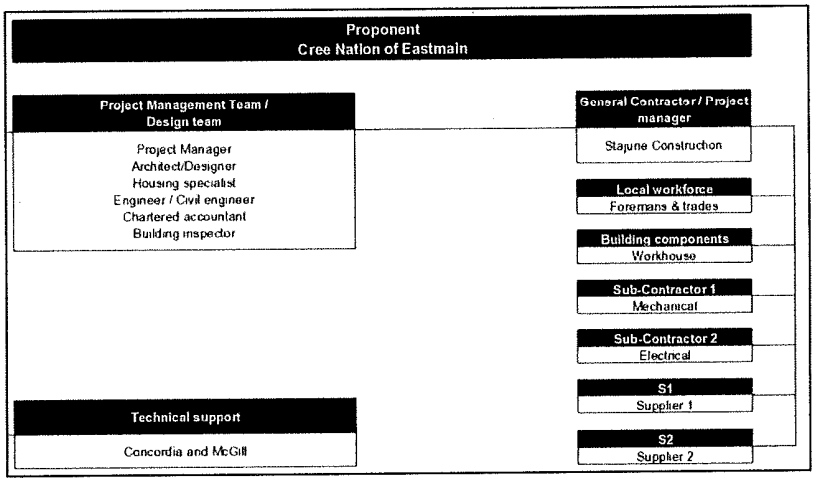
Workforce Capacity

The CNE will work with its construction company, Stajune Construction Inc., to implement the NZE program, each operating in their sphere of activity toward the success of the whole program.

The success of the NZE program rests on having a good foundation. In this case, the foundation is the project management team that will oversee the projects carried out under the NZE program and support to Stajune Construction in its management of the construction projects and cost control. The NZE Project Management Team will be made up of the resources identified in Figure 3.

The NZE Project Management Team has over 90 years of combined experience in finance and administration and 80 years in the construction industry. Project Management Team expertise includes financial management, LEED certification, super energy-efficient building techniques and northern and remote housing. The Team further benefits from the partnerships established with universities, government agencies and industry experts who have been involved in our NZE program.

Figure 3. Project Management Flow



Stajune Construction will act as the general contractor/project manager of the NZE construction projects. Work will be subcontracted out to local companies and entrepreneurs operating in the construction sector. The CNE has held consultations with local contractors who have all indicated their willingness to work collaboratively on the NZE projects. These contractors understand the critical issues and the importance of completing the various projects on time and on budget.

Current Workforce

In February 2019, the CNE held a construction meeting for the purpose of inventorying certain trades in Eastmain.

This inventory has allowed the CNE to identify lacunae in the community and the areas where capacity-building must be focussed. In the interim, there are specialized trades in other Cree communities and nearby Quebec cities who are eager to work on the pilot projects, while the CNE builds up its local capacity.

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Although the CNE did not do an inventory of general labourers, a Cree Nation Market Survey compiled by Cree Human Resources Development (CHRD), there are approximately 17 men and 22 women looking for employment in Eastmain. Given that Eastmain's total workforce is 498, this yields an unemployment rate of approximately 8%.

Capacity-Building

To be meaningful and impactful to the community, the NZE program must be sustainable well beyond the scope and timelines of the Smart Cities Challenge. The CNE must therefore ensure that it can develop the capacity of the local workforce. Throughout its NZE program, workers will develop specialized skills including

- net-zero energy building techniques
- wall systems construction
- flooring
- cabinetry
- electrical and plumbing
- HVAC installation and maintenance
- roofing
- retrofitting

Planning for capacity-building activities has already started. The CNE is currently working with potential partners who are experienced net-zero energy builders, to provide work placement training. Four carpenters have been identified for training on net-zero energy construction techniques and systems. The training will give these workers the skills required to carry out and supervise net-zero energy construction.

In addition, two CNE employees will also receive work placement training on net-zero energy retrofits. These employees will work with our partner on a retrofit project to be carried out between March and April 2019. The retrofit training will include

- air tightness principles and techniques
- net-zero energy techniques
- wall systems construction
- digital capture techniques for dimensioning existing buildings
- supervising net-zero energy housing projects
- the do's and don'ts in retrofit projects

As part of the training, the partner will conduct follow-up site visits during the construction phase of our NZE projects between 2019 and 2020, thus ensuring the net-zero energy skills are fully integrated and rooted in Eastmain.

Other trades people have expressed an interest in receiving training in electrical and plumbing and HVAC installation and maintenance. The CNE will work with the Cree School Board and its partners to identify training opportunities for local trades. More

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specifically, the CNE will begin exploring programs with the Cree School Board, CHRD and other vocational schools that offer certification programs in electrical, plumbing, carpentry and heating and ventilation systems. Ideally, training will be provided during the Smart Cities Challenge projects, with the goal of developing these skills in Eastmain within a five-year timeline. The CNE intends to invite skilled external tradespeople to Eastmain to work on NZE projects who will be required to hire local apprentices. It is anticipated that this approach will reduce construction costs because the use of external contractors generally means higher hourly fees and costs associated with travel, and room and board.

The CNE will not only focus on the trades side of the NZE projects but will also identify training opportunities aimed at augmenting project management capacities locally. Eventually, the CNE intends to have local people trained as certified project managers through the Project Management Institute. More importantly, the CNE will look to obtain comprehensive training in cost accounting and MS Project.

One identified area of concern is the need for qualified building inspectors. In fact, the lack of qualified building inspectors who can verify that homes and other constructions have been built to National Building Code standards is often cited as an underlying, contributing factor in the quality of construction projects in the Canadian north. Meanwhile, the CNE is presently training Home inspectors through a program funded by CHRD and offered by Cree Nation Government. These newly qualified Home inspectors will be instrumental in recommending suitable homes for NZE retrofitting to the Cree Nation of Eastmain.

The CNE has also identified other opportunities for capacity-building of the local workforce. These include

- collaborating with the National Research Council (NRC) to develop building science and related construction skills through seasonal employment of a local Indigenous engineering student on NRC building science research projects
- collaborating with Concordia University Department of Building, Civil and Environmental Engineering and the Centre for Zero Energy Building Studies to develop engineering and building science skills in Eastmain, which has a long-term goal of having a Cree engineer and encompasses the opportunity for a local Cree student to
    - ❖ work with the Concordia University data monitoring team to install equipment and collect data on our NZE projects
    - ❖ assist with project oversight and data collection relating to, amongst others, materials, production by trades and costing
    - ❖ enroll in the Engineering Co-op program and have a summer co-op placement in Eastmain

Financial Resources

Both the CNE and Stajune Construction are subject to independent public audit by a financial auditing firm. As part of the Cree Nation of Eastmain's IMS implementation, contractor and supplier management will also be audited throughout the NZE program.

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With the exception of the Smart Cities Challenge winner's prize and revenues that will be generated through the lease or sale of housing units, funding for our NZE program has been secured. In identifying funding, the CNE did not identify government and agency funding programs that may be accessed to complete projects under the NZE program because these must be applied for and, until approved, cannot be considered secured sources of funds. However, the CNE will apply for available funding under different programs.

The CNE financial resources include allocations from the CNE Local Economic Development Fund, the annual subsidies for housing and infrastructure under the Infrastructure Fund, funds from the Housing Action Plan and Cree Nation Government regular program subsidies.

Infrastructure Readiness

The actual construction of net-zero energy homes means that there must be sufficient space and adequate infrastructure to support the new construction. The CNE has recently completed a geomorphic study of the entire community.

Weather is always a risk in the James Bay region. Cold temperatures and snow can arrive early and often stay late into the construction season. The CNE knows that weather often results in delayed completion of construction and the deterioration of materials purchased for projects. While the CNE cannot control weather, it can take steps to mitigate the impacts weather has on its NZE projects. In order to attenuate the impacts that the northern climate has on the timely completion of construction projects and the inherent costs arising from delays, the CNE plans to establish a warehousing facility. The facility will be used to inventory and store construction materials and to assemble certain building components. More importantly though, by having a local warehouse, the CNE can order materials and supplies in bulk for projects before the start of the construction season, avoiding the added delays resulting from transportation times.

The CNE has carefully considered two options for such a facility. An existing warehouse in Eastmain that can be renovated to accommodate the needs of the NZE program, or the CNE can construct a new building. Each option was costed. Renovation of an existing warehouse will cost approximately $450,000 while a new build comes in at around $1,464,613 of which up to 70% can be leveraged through capital funding programs which amounts to almost $1,000,000 of the total cost. This brings the costs of a new build in line with those for the renovation.

The new build, as costed, would be significantly larger, at 8,100 square feet as opposed to 3,500 square feet for the existing facility. In addition, this facility will also be used for the assembly of building components thereby reducing construction times and lowering construction costs while creating employment and economic development opportunities in Eastmain. In light of these benefits, the CNE has chosen to proceed with applying for funding for the construction of a new facility. If approved, the CNE can proceed with construction in 2019. If the CNE is not allocated funding under these programs, it will examine the advantages of renovating an existing warehouse versus scaling the new build smaller in order to be able to carry out construction as funds becomes available.

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Table 5 – Comparison Facility New Build vs Renovation

Options	Description	Building area (sq2)	Cost
1	Existing warehouse renovation	3,500	$450,000.00
2	New building	8,100	$1,464,613 (which includes a maximum grant up to $1M)

The facility, if a new build, will be owned and operated in partnership by the CNE and Stajune Construction as a community project. The new facility would also serve as the offices of the CNE Housing Department and as a maintenance shop. The Housing Department will be responsible for the areas of the facility where bulk ordered construction materials for NZE homes are stored and for the Housing Department's preventive maintenance programs. Another area of the facility will be used for the assembly and storage of the building components.

The facility will allow for the assembly of building components during the months of November to May, eliminating costs that occur from building during winter conditions. As well as increasing the length of the building season, the facility will also take advantage of being able to carry out work in a facility that is dedicated specifically for constructing building components such as wall panels.

The stored materials will be used for housing units constructed under the Smart Cities Challenge, band housing, ongoing housing preventative maintenance programme, the construction of cabinets and the resale of building materials to Eastmain residents who have no local option for attaining building materials for household projects.

In the event the facility is not completed before the CNE must order materials for year 2 of the NZE program, there are other warehouse facilities in the community. These can be used on a short-term basis to store construction materials delivered before completion of the facility and to assemble the building components that will be needed in the upcoming projects.

Project Management Strategies

Our NZE program is ambitious and large-scale. With so many areas of activity it is essential to come up with strategies for addressing issues, managing procurement and supply chain, ensuring outcomes are impactful on the stakeholders and that communications enhance community inclusion. The CNE has systems and processes already in place that are the foundation to its project management strategies.

Risk Identification and Mitigation

All projects face challenges that threaten their success and none more so than construction projects that are vulnerable to weather, supply, transportation and many other factors. The CNE and its partners have identified these risks and designed strategies aimed at avoiding these risks or mitigating their impact on the NZE program.

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Since being selected as a Smart Cities finalist, the CNE has identified certain risks that it mitigated by adjusting its NZE program to ensure it can achieve the stated outcomes. More particularly, the CNE had concerns that the timelines, vis-à-vis its present capacity, and financial resources put at risk the success of the NZE program. Consequently, the CNE has modified the timelines and milestones, setting attainable objectives and phasing in parts of its NZE program. By starting with smaller, more contained projects, the CNE will be able to test its processes and procedures and validate its choices to ensure the success of the NZE program.

CNE has also had to re-evaluate its initial proposal after it carried out program costing. Presently, there are no programs in Quebec that support residential applications of solar and alternative energy. As a result, the inclusion of certain net-zero energy technologies added significantly to the costs of construction of NZE homes. In order to control these costs, the CNE has considered constructing net-zero ready homes provided that these homes achieve near net-zero performance and offer the same characteristics in terms of design and resilience. And develop a local "Green Technologies" program to subsidize the purchase and installation of solar photovoltaic systems, similar to programs in other provinces.

There are also risks inherent in relying on technology which may be protected by patent or copyright, difficult to obtain or service or subject to frequent modifications. By relying on commercially-available technology and equipment the CNE will be reassured of their quality and availability as well as the ability to obtain professional technical support when needed.

Table 6 – Risk Analysis

Cause	Risk	Mitigation measures	Risk (3 to 1)
Lack of available workforce	Failure to attain level of local capacity needed for projects	▪ Recruit locally for skilled trades ▪ Train additional tradespeople ▪ Contract/hire externally	2
Design flaws Energy modelling based on assumed data Quality during construction	Failure to reach net-zero targets	▪ Carry out additional data modeling using alternative programs ▪ Use data from weather station to verify assumptions in energy modeling ▪ Re-evaluate NZE construction details and technologies ▪ Implement inspection program and increase frequency of site inspections ▪ Augment net-zero construction training for skilled trades	1
Incorrect estimates of quantity of materials needed Construction modifications on site	Insufficient inventory of construction material	▪ Implement inventory control system ▪ Order materials 8 months before project start date ▪ Order needed materials for shipment to warehouse ▪ Evaluate and improve inventory control and estimates exercise	2

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Unexpected events on site Weather Extra work on site Incorrect productivity and work duration estimates	Failure to meet construction timelines	▪ Apply contractor/supplier management best practices ▪ Apply contract reward/penalty clause ▪ Hire experienced construction PM ▪ Use a project management software ▪ Conduct periodic evaluations of construction and project management processes ▪ Hire additional skilled tradesmen ▪ Implement process improvement measures ▪ Adjust project scope and timelines	1
Unexpected events on site Weather Extra work on site Wrong productivity and works duration estimates Wrong cost estimates	Cost overruns	▪ Implement contractor/supplier management best practices ▪ Hire experienced construction PM ▪ Conduct audit on all construction and project management processes ▪ Adjust project scope and budgets ▪ Identify source of cost overruns and apply audit findings to improve efficiencies	1
	Inability to sell units if purchasers cannot obtain financing	▪ Pre-screen and pre-qualify purchasers ▪ Identify new purchasers ▪ Reclassify private homeownership unit as rent-to-own	2
	Contractor unable to secure necessary financing to carry on construction work	▪ Assist companies in accessing capital funds on a project-by-project basis ▪ Encourage partnerships and joint ventures between companies to improve financial capacity ▪ Manage the project directly through Stajune ▪ Increase CNE investment in the project	2
Fail to do credit check / obtain information on tenant financial capacity	Inadequate rent collection to support operation/maintenance of rental units and to build reserve funds	▪ Pre-qualify renters through credit check ▪ Verify capacity to pay ▪ Credit bureau reporting on delinquent accounts ▪ Ensure agreements are fair to CNE and tenants but protect CNE investment ▪ Terminate rental agreement and evict delinquent tenant ▪ Require solvent co-signer on rental agreements ▪ Sanction arrears by forfeiture of CNE subsidies and application of grants to rental arrears ▪ Suspend eligibility for CNE grants, loans and subsidies to persons with rental arrears ▪ Take legal action	2
Incomplete surveys or site inspection	Ground bearing capacity too low (geotechnical)	▪ Verify ground composition with a geotechnical survey ▪ Mention geotechnical details in contract documentation ▪ Install piles or other system to reinforce foundations	2
	Incomplete building design	▪ Foundation modifications with geotechnical survey ▪ Verify design exceptions (solar panel, insulation, etc.)	2
	Lack of interest from buyers	▪ Explain NZE experience by using pamphlets ▪ Bring out the difference made in community and chance to realise unique projects	2
	Experience in NZE units does not meet occupants' expectations	▪ Confirm occupant satisfaction with the design ▪ Ensure design meets occupants' need before occupancy ▪ Conduct extensive and redesign of future housing units	2
	Negative reaction to living in multi-unit housing	▪ Evaluate underlying issues affecting satisfaction ▪ Elaborate construction strategies to address these issues ▪ Conduct consultation to identify occupants' concerns and needs	2

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		▪ Develop and implement a strategy that addresses these issues	
	Improper use of building technologies (smart, HVAC, alternative energy, security)	▪ Pre-occupancy education and training ▪ Create/distribute information pamphlets and labels ▪ Carry out inspections and surveys ▪ Train occupants in the use of all technologies	2
Incomplete information given to occupants on their role in NZE program	Occupants do not consent to the collection of personal information	▪ Explain stakeholder engagement that clearly adheres to all PIPEDA principles ▪ Restrict data collection to units where occupants gave consent ▪ Restrict data access to CNE or external, as the case may be ▪ Take steps to alleviate occupants' concerns with data collection	3
Mismanagement of data Database system incomplete or missing	Intentional or unintentional data loss or data security breach	▪ Execution of data storage and security agreements with partners based on PIPEDA principles ▪ Application of CNE ISO/IMS and audit programme ▪ Institute preventive measures and corrective actions identified in the audit programme ▪ Re-evaluate and make necessary changes to data access and security arrangements	2
Collaboration contract not made Terms of the research were not explained or well understood	Resident disengagement from long-term research activities assessing impacts on well-being	▪ Conduct community meetings with partners to discuss relevancy of project objectives to residents' needs ▪ Establish communication plan to engage meaningfully with residents through sharing circles, social media and other forums ▪ Adapt the project continuously to reflect community feedback ▪ Communicate with local CMC workers to identify and address barriers to community engagement	3
	Housing assignment leads to real or perceived iniquity amongst CNE members	▪ Conduct analyses of changes in home and health status and health over time ▪ Identify at-risk sub-population groups based on analyses ▪ Adapt housing policies to implement suitable interventions to populations groups most at-risk for housing inequities	2

**Note: highlighted risks directly linked to KPIs in Table 11.*

***Note: floor plans were designed to allow living area to be reduced by removing rear section from first floor.*

Procurement

In order to control the costs of the NZE projects, the CNE has created a procurement strategy. The strategy was developed with significant consultation with industry stakeholders to ensure its feasibility.

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Table 7 – Procurement Strategy

PURCHASING & EXECUTION STRATEGY			
Purchasing strategy	▪ Benchmark ▪ Use of local workshops ▪ Material transport optimization ▪ Use of cost comparison sheet ▪ Use of progressive billing for each contract ▪ Apply holdbacks ▪ Detailed cost breakdown ▪ Formal tendering process ▪ Use of templated CNE contracts prepared ▪ Bulk material ordering (see project execution strategy)	Project execution strategy	▪ Specially timed purchasing of construction materials ▪ Construct or rehabilitate a facility used to warehouse construction materials ▪ Implementation of processes for inventory control ▪ Purchase large quantity items and carry out procurement in the fall for the following year ▪ Invite specific suppliers to negotiate further on costing and quality of materials ▪ Prepare detailed list of materials used
Approved by	**CNE financial administration**	**Date**	

Important savings can be generated through bulk and specially-timed purchasing of construction materials. As previously explained, the CNE will construct or rehabilitate a facility that can be used to warehouse construction materials. This will enable the CNE to implement processes for inventory control which in turn will play a role in maintaining adequate inventory to complete projects on time and on budget.

Identifying what to purchase will be done when the CNE completes its pilot projects (Accessible House and 1st Retrofit) in year 1 and prepares a list of all materials used.

All procurement of materials and services must comply with the CNE Financial Administration By-law and established policies. This By-law imposes approvals procedures and certification of available funds prior to contracting. Any gaps in the By-law will be filled by procedures aimed at ensuring fairness, openness and transparency in the procurement process that favour accountability and responsibility.

The CNE has established relationships with suppliers to ensure that they understand the procurement process going forward. In addition, the CNE will ensure that it always has a Plan B with an alternate supplier in the event a selected supplier is unable to respond to the NZE project needs. Where appropriate, standardized, templated contracts prepared by the CNE will be used. These contracts set out clear deliverables, timelines and the obligations on each party to favour a constructive, collaborative relationship with suppliers.

Concordia University will be assuming responsibility of procuring the technologies to be used to monitor the performance of the homes. Concordia will contribute $25K to the purchase of equipment. The CNE is actively seeking additional partners to offset costs. If a partner is not found, the CNE will cover the costs through project funds.

Stakeholder Impact and Influence

There are several stakeholders in our NZE program. From residents to local businesses and outside suppliers to governments and agencies, our NZE program will impact these

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stakeholders in different ways. All stakeholders can impact the success of the NZE program and influence its implementation.

Stakeholder engagement will use the principles set out in the CNE Quality Management System and be auditable within the scope of our Information Management System (ISO/IMS).

Table 8 – Stakeholder Impact and Influence

Stakeholder	Impact on Stakeholder / Stakeholder influence on NZE program
Residents	Most impacted stakeholders as will have opportunity to own or rent an NZE home
	Success of private homeownership program will depend on interest in investing in houses
Suppliers	Impacted by new business and economic development opportunities
	Influence the affordability of NZE housing which will impact success of NZE program
Local Business	Impacted by employment and economic development opportunities
	Influence the success and affordability of our NZE program
Council	Impacted by success of program in fulfilling promise to create a stronger, healthier community
	Influence the success of NZE program through budgetary appropriations and funding
Government Agencies	Influence stakeholder policies and programs by the findings of monitoring and studies
	Influence the success of NZE program through funding programs and policies

Through the program, Eastmain residents will be the most impacted and influential on NZE program success. The opportunity to own a home is gaining momentum in Eastmain as a means for enabling residents who have the financial capacity to move away from the social housing program and fulfill a dream shared by many Canadian - that of having one's own home. Nonetheless, the sale of NZE Private Homeownership Houses will be dependent on the interest and motivation of residents to obtain loans through financial institutions.

The NZE program will have an impact on and influence the sense of community pride. To be enduring though, it is essential that occupants of NZE homes understand the functionality of these homes and the technologies used. The goal is to ensure occupants get the most out of their homes. Consequently, every occupant of an NZE home, regardless of the type of home, will receive training and information on the operation and maintenance of their homes including,

- the use of the monitoring equipment
- cleaning and replacing HRV filters
- programming thermostats
- monitoring solar energy production
- monitoring daily energy use

Suppliers

Suppliers of construction materials will influence the affordability of NZE housing and the ability to sell Private Homeownership Houses in Eastmain. If the costs are excessive, this

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could prevent expansion of a private housing market. However, Suppliers will have an interest in ensuring success as this can lead to partnerships to provide construction materials to the CNE for its NZE program. The CNE will leverage the potential scope of its NZE program to ensure suppliers see long-term benefits in ensuring affordability.

Local Business

Local construction companies and tradespeople will directly impact the success and affordability of our NZE program. If the costs are excessive, this will limit the number of houses that can be built by the CNE and could put at risk its stated goal of addressing the housing crisis and building a strong, healthy community.

However, the NZE program will be very impactful on local construction companies and tradespeople. There will be substantial opportunities for local construction companies and tradespeople to specialize in assembling building components and gaining NZE building expertise, including opportunities to be licensed as carpenters, electricians, plumbers or HVAC technicians. Construction companies and tradespeople will be assured of year-round work since assembly would be done in the off-season. Moreover, the CNE has put time and effort into identifying and planning training to increase the numbers of skilled tradespeople.

Council

Council will influence the ability of the CNE to carry forward the NZE program. If adequate annual funding contributions are not approved for each of the six years, then the CNE may be unable to carry out all or certain projects in a given year. The NZE program will be particularly impactful on Council if it achieves the stated goal of reducing the backlog in housing and creating a healthy and strong community.

Government Agencies

Through their support of the NZE program, government agencies can influence its success. If funding is provided for training and certification opportunities, for green energy initiatives and for housing, this will supplement funding allocated by Council. This support will fuel immediate, short-term success but will also contribute to the sustainability of our NZE program.

Our NZE program could potentially influence government agencies' thinking and strategies on housing in Indigenous communities.

Communications

The CNE will continue its community engagement process including, the Cree Cafés, general assemblies, housing forums and special community meetings. This engagement process will enable the ongoing assessment of the community's NZE experience and aspirations.

In the 2019-2020 fiscal year, the CNE will also start leveraging social media as a means to receive feedback on its NZE program. This process has already started as the CNE is

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planning to redefine and redevelop its website so that it offers more and better information to CNE members.

The CNE is also developing a training program for NZE home occupants on the functionality of their NZE homes. This program will include one-on-one sessions delivered by a Cree Nation Government housing specialist.

A project management communication plan was prepared and will be followed in order to implement the construction phase of NZE projects according key performance indicators[4], year after year through the whole project cycle.

Table 9 – Communications Strategy

Communication	Frequency	Goal	Responsible
Project team			
Project status report	Weekly	Review project status and discuss potential issues or delays	Project manager
Team stand up	Daily	Discuss team member activities of previous day and current day, and any obstacles	Project manager
Task progress updates	Daily	Share daily progress made on project tasks	Project manager
Project review	At milestones	Present project deliverables, gather feedback and discuss next steps	Project manager
Post-mortem meeting	At end of project	Assess what worked and what did not work and discuss actionable takeaways	Project manager
Project proponent			
Project status report	Weekly	Review project status and discuss potential issues or delays	Project manager
Project review	At milestones	Present project deliverables gather feedback, and discuss next steps	Project manager

Monitoring, Controlling and Reporting

Monitoring will be essential to ensuring productivity, scheduling and timeframe goals are respected. During construction, daily site visits and inspections will be carried out by the project manager and CNE building inspector. Both will report to the CNE on the advancement of the project(s) and any issues. This process will enable the CNE to monitor project deliverables and major milestones in each project and react, if required, to any issues in a timely manner.

[4] The KPIs are described more fully in the monitoring, controlling and reporting strategies section and Table 7 below.

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The man hours worked, and all materials used will be recorded by an onsite foreman with respect to all labourers and construction material. Having this information is particularly important as it will ensure that the CNE can properly plan the costing and time requirements for the different housing projects.

Table 10 – Monitoring, Controlling and Reporting Strategies

Financial management
▪ SAGE 300 Premium with customized Cost Accounting modules ▪ MS Project Manager add-ons that is auditable to the International Financial Reporting Standards (IFRS) ▪ Chartered accountant
Project management
▪ Experienced project manager responsible for all the monitoring, controlling and reporting ▪ Record of worked man hours by onsite foreman. ▪ During construction, daily site visits and inspections carried out by the project manager building inspector

Technical monitoring			
Monitoring	**Inspection**		
Net-zero monitoring ▪ Hygrothermal performance of the building envelope to ensure durability ▪ Indoor environment quality including (air quality and thermal conditions) ▪ Energy performance including end energy use of HVAC equipment, lighting, appliances and equipment ▪ Energy generation of the photovoltaic system	**#**	**Phases of inspection**	**When**
	1	Foundation	Before backfilling
	2	Framework	Before door and window installation
	3	Tightness	Before drywall installation
	4	Exterior cladding	Before commencing exterior cladding
	5	Interior finishing	Interior finishing

The CNE has an asset management system that includes computerised preventive maintenance management system for the community, which includes the housing department.

An important part of the management plan will include the key performance indicators as presented below.

Table 11 –KPI Tracking

#	Title of Key Performance Indicator	Measure unit	Target value
1	Energy consumption of each unit	kW/h/year	Production equals consumption
2	Indoor environmental quality	Relative Humidity CO2	40– 50 % 350-1000 ppm.
3	Construction cost	$	< 10% budget overrun
4	Number of units	Number of units/year	As planned

The logical framework below is a management tool that gives a summary of a project, in this case the Accessible House project, to describe the project objectives, methods for verification and risks on an outcomes-based methodology.

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Table 12 – Logical Framework for Accessible House pilot

TITLE OF PROJECT: Accessible House Pilot Project	**Project Starts:** Jun 2019 **Project Ends:** Sep 2019 **Date Today:** Nov 2018	
DESCRIPTIVE LEVELS	**METHODS FOR VERIFICATION**	**PROJECT RISKS**
OBJECTIVES ▪ Design a culturally-appropriate accessible house adapted to special needs of individual confined to a wheelchair ▪ Develop construction details for attaining net-zero energy performance to reduce operating costs ▪ Determine level of solar production required to attain net-zero energy performance ▪ Evaluate and develop cost-effective construction techniques to ensure end costs are affordable for social housing	▪ Design verification through interviews with special needs tenant on satisfaction and responsiveness of lay-out ▪ Post occupancy energy monitoring of energy consumption patterns ▪ Verification of net-zero status, including energy performance of the solar system, through extensive energy monitoring ▪ Detailed post-construction evaluation of construction costs and a cost benefit analysis of the construction system and technologies	**OBJECTIVES VS OUTPUTS** ▪ House does not meet the needs of special needs tenant, his caregiver or medical support staff ▪ Building system is not cost-effective ▪ House does not attain net-zero energy status ▪ Tenant does not consent to disclosure of data collected on the project and unable to collect data on individual energy use patterns ▪ Selected tenant refuses to move in or fails to qualify for social housing
OUTPUTS (Expected Results): ▪ Completed Accessible House for Eastmain resident with special needs ▪ Energy monitoring over two years including detailed energy consumption and energy production data ▪ Reporting on the net-zero energy status of the house and its potential for certification as a net zero energy building. If net zero energy status is not attained, strategies for attaining this on subsequent houses will be developed and included ▪ Reporting on the net-zero energy building system, including a cost/benefit analysis of the net-zero building system ▪ Reporting on the house design based on feedback from the tenant, his medical support and the community	▪ Design verification through interviews with tenant on success of the design in addressing special needs ▪ Verification by building inspector that the house meets all code and other requirements ▪ Verification by an energy modeller that the design of the building meets net-zero performance ▪ Confirmation that all suppliers and builders/trades have been paid ▪ Signed lease agreement	**OUTPUTS VS INPUTS:** ▪ Tenant is not satisfied with the unit ▪ Local builders do not cooperate fully ▪ Supply chain is unwilling to negotiate effective cost saving measures ▪ Lack suitable lot for development ▪ Cost of construction is greater than available resources ▪ House does not attain net-zero energy status ▪ Adherence to all project management activities, timetables, and budgets ▪ Construction impacted by weather conditions ▪ Accessible House built according to plans and specifications
INPUTS: ▪ Significant community and individual engagement to develop designs that take into consideration cultural components ▪ Evaluation of the design must-haves of special needs tenant ▪ Evaluate the building system and the capacity required for the alternative energy system (solar) through energy modelling	▪ Submission of bids submitted by contractors and subcontractors ▪ Confirmation of available funds ▪ Preparation and execution of contracts and financial documents ▪ Completion of Tenant Selection Form ▪ Confirmation of lifetime subsidy from CMHC ▪ Confirmation of mortgage from the bank ▪ Receipt of all plans and specifications for construction	**PREREQUISITE CONDITIONS:** ▪ Lot with the proper orientation ▪ Optimum roof angle to maximize solar performance ▪ Local climatic data ▪ Energy requirements of the home based on the building system ▪ Calculation of energy needs and the size of the solar array based on energy needs to meet net zero

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▪ Develop plans for construction ▪ Engage with supply chain to establish a detailed materials list, costing and cost saving strategies ▪ Engage with local builders in elaboration of the building system and to identify the most cost-effective measures ▪ Engage experienced net-zero builders and skilled tradespeople familiar with the local environment ▪ Project management team experienced in net zero construction and cost accounting ▪ Capital development plan ▪ Available financial resources	▪ Adoption of Council resolution	▪ Working drawings and detailed materials list ▪ Approved budget and secured sources of funding ▪ Contractual agreements that favour local capacity development ▪ Open book agreement with the construction companies to capture actual cost variables such as materials, labour, profit and administration ▪ Engagement with suppliers to develop ways to reduce material and delivery costs, and improve the stock of building supplies available within the community ▪ Occupant qualifies for social housing ▪ Project approval by Council

Sustainability

Table 13 – Sustainability Strategies

SUSTAINABILITY
STRATEGIES
The CNE has implemented various strategies which guarantee sustainability of the NZE program ▪ Taking a holistic approach ▪ Community members and stakeholders involved in defining and designing the NZE program ensuring the project can reach its full potential and respond to the needs of the community ▪ Laws, rules, guidelines and NZE projects discussed with suppliers and builders to ensure that they fully comprehend the framework and the expectations ▪ Through occupant feedback, the CNE will develop new designs and floorplans ▪ Rigorous monitoring and reporting requirements will enhance the level of trust residents have in the program **Training program** ▪ Training opportunities ▪ Hands-on training ▪ Certification opportunities: develop new skills or improve on current skills ▪ Business opportunities: new opportunities for employment and business development ▪ Lead to a stronger more economically and socially viable community The training and capacity building programs are being developed to enhance skills of local tradespeople with respect to net-zero energy construction and retrofits. Ensuring this capacity is essential for addressing the cost of constructing housing in the community, a key component in the SCC proposal. **Business plan for the development of the warehousing/building component assembly facility** This is being done for the purpose of developing a local housing industry and reducing the costs associated with private homeownership. The CNE will consider expanding the type of building components assembled to include roofing systems and foundation systems. This facility may allow the CNE to build a specialized sector supplying building components to other Indigenous and non-indigenous communities.

The CNE NZE program is guaranteed to be sustainable because of the holistic approach taken. From the beginning, community members and stakeholders have been involved in defining and designing the NZE program. This is essential to garnering the support necessary for such an ambitious program, ensuring it can reach its full potential and respond to the needs of the community.

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The CNE has also discussed the laws, rules, guidelines and NZE projects with suppliers and builders to ensure that they fully comprehend the framework and the expectations but also adjusting the NZE program to respond to certain realities identified by the suppliers and the builders. This step ensures that the NZE program is affordable and therefore attainable.

The monitoring and reporting mechanisms put in place by the CNE will also facilitate the NZE program sustainability. Having rigorous monitoring and reporting requirements will enhance the level of trust residents have in the program and ensure that costs are consistent for each type of housing unit constructed. Past experience has shown the CNE and Eastmain residents that housing costs can vary significantly even for similar housing types built during recent construction seasons, which undermines residents' confidence in the residential construction industry.

Finally, sustainability depends on building capacity in Eastmain. Providing training opportunities, hands-on training, certification opportunities and business opportunities will enable Eastmain residents to develop new skills or improve on skills they already have and offer new opportunities for employment and business development. This can only lead to a stronger more economically and socially viable community and ensure that the NZE program can continue.

The training and capacity building programs are being developed to enhance skills of local tradespeople with respect to net-zero energy construction and retrofits. Ensuring this capacity is essential for addressing the cost of constructing housing in the community, a key component in the SCC proposal.

To continue its NZE program, the CNE is preparing a business plan for the development of the warehousing/building component assembly facility. The CNE will consider expanding the type of building components assembled to include roofing systems and foundation systems. This facility may allow the CNE to build a specialized sector supplying building components to other Indigenous and non-indigenous communities.

As long as there is a demand for housing our NZE program will continue well beyond the Smart Cities Challenge. Our approach has been to establish Eastmain as the expert in the region on building net-zero energy houses. There is a backlog of more than 3,600 houses in Eastmain and the other Cree communities in Eeyou Istchee. This means that the CNENZE program has the potential to continue well beyond the timelines of the Smart Cities Challenge.

CHAPTER 4: TECHNOLOGY

Approach

The CNE's NZE program grounded on the use of smart technologies and construction technologies that are intended to enhance occupants' comfort and enjoyment of their homes and the homes' resiliency and efficiency.

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While the developing the designs for the NZE houses entailed extensive community consultation, the design of the building systems and selection of the systems and technologies required to reach net-zero energy performance was carried out by a small technical team composed of experienced net-zero builders and a design consultant. The Team evaluated available technologies and construction techniques for the design of the systems to be used in the houses. Local builders were also consulted during this process to ensure that the systems and technologies identified for the project could be installed and maintained in Eastmain.

Energy Modelling

The first stage in the design of a net-zero energy building is to identify where energy consumption reductions can be maximized (through the building envelope, housing equipment and technologies) in order to lower the energy production needed to attain the net-zero energy target. This process included

- examining wall systems used in other net-zero housing projects
- drawing from lessons learned on super energy-efficient northern housing prototypes
- drawing from lessons learned on the modelling of other net-zero energy projects
- reviewing ongoing research being carried out in this field of work, including
  - *Panelized Building Systems for Northern Multi-Unit Residential Buildings*, prepared by Cold Climate Building Inc. for NRCan
  - *Design and Construction of Multi Unit Residential Buildings (MURBs) in First Nations communities: Challenges and Opportunities*, prepared for CMHC
  - *Net-Zero Energy Housing: CMHC's Equilibrium Program*

The Team put together by the CNE conducted energy modelling on the Accessible House and the Six-Plex[5] as these would be the first new housing projects constructed under our NZE program.

The Team first evaluated wall systems that had been successfully used on NZE houses in Edmonton, Alberta and other locations. An initial building envelope selection was made based on the experience acquired on net-zero single-and-multi-family builds. In addition to the requirement for net-zero energy performance, the Team took into account Eastmain's climate and the need for durable, easy-to-execute solutions that deliver good occupant comfort and moisture control. At this early stage, the potential for prefabricating the system in a small local warehouse also became a significant consideration.

HOT2000 simulations were conducted on both the Accessible House and the Six-Plex using the same building envelope details for both. Several iterations were run as part of this exercise to test different combinations of building components (See Annex B, C, D and E).

[5] It should be noted that the Six-Plex is a multi-client build that offers the full range of occupancy: private homeownership, rent-to-own and social housing.

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At the same time, the Team ran a HOT2000 file using electric resistance heating and hot water and set the coefficient of performance of the cooling system to 1.0. The exercise delivered some surprising results with HOT2000 showing a cooling load in every month of the year – January to December – in the 7400 heating degree day climate of Eastmain. The annual cooling demand was greater than the annual heating demand.

Table 14 – Accessible House HOT2000 Results

	HOT2000 Homesol (kWh/a) *(adjusted)*	COP	HOT2000 Homesol (kWh/a) *(adjusted)*	HOT 2000 PA (kWh/a)	COP	HOT 2000 PA (kWh/a)	IES VE (kWh/a) w/ Heat Pump COPs
Annual Heating Demand	2774	1.4	1981	2650	1.4	1893	5535
Annual Cooling Demand	8617	3.5	2462	5293	3.5	1512	94
Annual DHW	4395	2.6	1690	5562	1.5	3708	2633
Lighting, Appliances, and Misc Electrical	7000	1	7000	6500	1	6500	6000
Total Annual Energy Required			**13134**			**13613**	**14262**

In both cases, the HOT2000 predictions for peak heating capacity seemed low when compared to the Team's experience with high-performance buildings in Edmonton's milder climate, while the peak cooling load seemed high.

Table 15 – Accessible House Heating and Cooling Loads

	HOT2000 (PA) Peak Watts	HOT2000 (Homesol) Peak Watts	IES VE Peak Watts
Design Heat Loss at -40C	3261	3100	5940
Design Cooling Load at 25C	1605	3600	2900

The results were far enough from expectations that the CNE commissioned ReNu Engineering to run a dynamic energy model using IES VE for comparison (See Annex F).

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Table 16 – Hot 2000 IES VE Energy Modelling Comparison

HOT2000 and IES VE Energy Balance for Accessible House	HOT2000 (kWh/a) *(adjusted)*	COP	HOT2000 (kWh/a) *(adjusted)*	IES VE w/o Heat Pump COPs (kWh/a)	COP	IES VE w/ Heat Pump COPs (kWh/a)
Annual Heating Demand	2774	1.4	1981	8500	2	5535
Annual Cooling Demand	8617	3.5	2462	329	3.5	94
Annual DHW	4395	2.6	1690	6583	2.5	2633
Lighting, Appliances and Miscellaneous Electrical	7000	1	7000	6000	1	6000
Total Annual Energy Required	22786		13134	21411.5		14262
Annual output from 45 – 330-watt PV modules	15500		15500	15500		15500
Potential Annual Surplus	-7286		2366	-5912		1238

An analysis of the results did not explain the departure from expected results. However, independent longhand calculations based on the hourly weather data for La Grand Riviere, Quebec, a location with similar climatic data, favoured the IES VE results. The Team therefore chose values closer to the IES VE results to calculate the net-zero energy balance.

HOT2000 results for the Six-Plex were similarly surprising. Although these results have not been tested against the IES VE energy model, it will be possible to utilize the significant extra roof capacity of the Six-Plex to install additional solar photovoltaics if it is necessary to increase energy production in order to achieve the net-zero energy target.

The energy modelling exercise was also used to determine the other technologies and building equipment needed to achieve the net-zero energy target. This included assessing windows (fiberglass frame, triple glaze, double low e and argon filled), appliances (top 20% Energy Star performance) and lighting (LED) as well as the size of solar array required.

Based on the modelling, the roof design of the Accessible House was modified to increase the size of the solar array. Modelling also disclosed that solar energy alone would not enable the house to attain the net-zero energy target. Consequently, the Team gave significant consideration to the desirability of using an air-source heat pump versus a ground-source heat pump to ensure net-zero energy performance. Even though lower in energy performance, the Team selected the air-source heat pump because of its significantly lower installation costs and maintenance requirements.

The super insulated envelope, air-tight construction, and energy recovery ventilation system allows for a 90% reduction in annual thermal energy demand intensity relative to typical construction. The significantly reduced thermal energy demand when combined with the high-performance mechanical system and on-site renewable energy generation allows for annual net zero energy consumption. This results in an annual greenhouse gas emissions savings of 861 kg CO_2 eq for the Accessible House as compared to standard construction techniques.

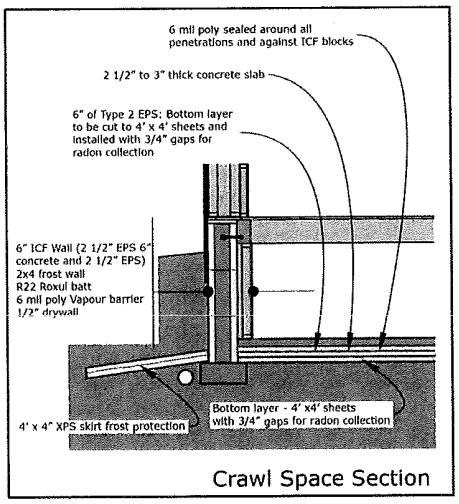
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The Building System

The selection of building materials and equipment were heavily influenced by Eastmain's remoteness and the impact this has on construction costs and housing affordability. The components of the building envelope were selected on the basis of their

- affordability
- durability
- ability to be constructed by local tradespeople
- ability to deliver the very high level of energy efficiency required for net-zero energy performance in cold climates

Figure 4. Crawlspace Detail.



Typically, houses in Eastmain have been built on full-height poured concrete foundations – a system that is known to be costly and a problem area for mould issues in many houses in the community. For this reason, there was considerable interest in exploring alternative foundation systems for houses to be constructed under the NZE program. Detailed costing and energy modelling were carried out on the use of slab on grade versus a frost-protected shallow foundation (crawlspace). While modelling showed there was very little difference in the energy performance of the two foundation types, consultation with local builders disclosed their concerns with slab on grade foundations vis-à-vis accessibility to plumbing and other household systems. Local builders also indicated that a shallow foundation was more feasible and made it easier to install services. In addition, the Team determined that the site preparation for a shallow foundation is simpler and less susceptible to inclement weather. Based on feedback and these other considerations, the Team selected a frost-protected shallow foundation for the CNENZE program.

The frost-protected shallow foundation will consist of a 4' high, 6" insulated concrete foundation (ICF) wall on an appropriately sized concrete spread footing. The crawl space will be sealed with a continuous air and vapour barrier and included in the heated envelope. The effective insulation of the foundation wall is R-43, the under-slab insulation is R-24 and the footing skirt is R-20. To minimize the use of concrete, an expensive commodity in Eastmain, the foundation wall was reduced to 6" and the under-slab to 3".

All houses constructed under the NZE program will have a double 2x4 cellulose filled wall with a protected interior air/vapour barrier and an exterior airtight water-resistant barrier. The assembly includes a 2 ½" interior insulated cavity to accommodate services. This assembly was chosen because it satisfies all the below criteria.

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- **The system is economical**
  Double stud 2x4 walls have been consistently shown to be the most economical method of building a high R-value wall, particularly when compared to the commonly used application of layering foam insulation to exterior of wall assemblies.

- **The system is durable**
  High R-value walls generally means a higher risk of condensation on the inside surface of the exterior sheathing. The Team has mitigated this risk in the selected wall system in several ways. Firstly, the wall system will use a well-sealed air-vapour barrier using taped foil-faced fiberboard to substantially reduce infiltration of moisture in the walls. Air leakage in the envelope will be reduced by using the Cossela Dorken Delta Vent SA, a sealed air-tight, vapour open, water-resistant barrier. In addition, the walls will be filled with cellulose insulation, which is highly hydrophilic, to absorb and allow the slow diffusion of any remaining moisture. Diffusion of moisture will be facilitated through diffusion vents installed high in each stud cavity, which will allow any moisture that does accumulate to escape into the vented rain screen. The R-values and air tightness are such that the inside surfaces will remain well above the dew point over a wide range of temperatures thus decreasing the risk of condensation and mould in the NZE houses.

- **The system materials are easily obtained**
  Other than the Delta Vent SA, the water-resistant membrane and the cellulose insulation, all the materials are readily available in Eastmain. The Delta Vent SA membrane and the cellulose insulation are easily found in the normal construction supply chain.

- **The system is buildable by the Eastmain workforce**
  Assembly of the wall system is very similar to standard western platform framing, a common residential construction technique used all over North America. The use of a 2x3 wiring chase inside a sealed foil-faced fiberboard vapour barrier is currently used in a housing project being constructed in Eastmain. The use of exterior rain screens is also common.

- **The system provides excellent energy performance**
  The wall system has an effective R-value of 53. Any increase in the R-value above this level would not be cost-effective because it would provide minimal additional energy savings at a comparatively high cost.

The Team selected fiberglass framed, triple glazed, argon filled sealed window units with 2-Cardinal LoE272 coatings. The roof cavity will be configured to offer a total R-80 (approximately 24") of cellulose insulation. The ceiling vapour barrier will be installed and sealed to the bottom of the trusses and supported with 2x3 strapping 24" on centre prior to building the interior partitions which will provide a chase for electrical wiring without penetrating the air/vapour barrier.

Particular attention was given to the selection of a Heat Recovery Ventilator (HRV). HRVs have been used in Eastmain homes for several years, but their performance has been inadequate. Often, the performance issues arise from improper HRV installation, or the

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decision by occupants to turn the HRV off because of (a) a misperception that these contribute to high energy costs, (b) noise, and (c) the impression that cold air enters the home through the HRV. The poor performance of HRVs in Eastmain, regardless of the reasons, reflects one of the ongoing challenges to maintaining healthy indoor environments in houses across the Canadian north.

In order to address this issue, the Team worked with an HVAC consultant to design an HVAC system for the NZE program. The Team carried out a second modelling exercise using dynamic IES VE 3D building performance analysis software to confirm findings and further evaluate air conditioning requirements. Based on this modelling exercise, the Team finalized the design of the building system and construction details and made changes to the roof design to allow for additional photovoltaics. The energy modelling was then finalized using these selections (See Annex G).

Our Technologies

A wide range of technologies will be introduced to the community through the CNENZE program. All these technologies, including new technologies not yet used in the community, are commercially available.

The technologies selected have a role in ensuring the NZE program attains the net-zero target, in monitoring and evaluating the houses and in building the houses. The Team evaluated energy saving and energy producing technologies including the building system (i.e. the design and construction of a foundation, walls and ceiling), building components (windows, doors, lighting, etc.), the HVAC system, and the solar photovoltaics.

Net-Zero Energy Housing

Although net-zero energy homes are not new to Canada, they are new to the Canadian North and to the Eeyou Istchee. Throughout Canada, innovations in the residential construction industry are developed locally and regionally, and innovations developed in one region must be tested in another. In each of Canada Mortgage and Housing Corporation's Equilibrium projects, for example, innovation focused on the specific combination of building systems and technologies that were used to achieve net-zero. For this reason, the Equilibrium programme targeted the development of net-zero energy housing prototypes across the country, except the north. The net-zero energy innovations also focussed on developing and refining construction processes to ensure that net-zero energy homes are competitive on a cost-benefit basis. This has been the same focus in Eastmain.

The CNE will ensure it builds capacity locally with respect to new technologies and systems being introduced into the community under the NZE program. As such, capacity building will be provided in areas such as solar photovoltaics, air-source heat pumps, energy monitoring technologies and smart home technologies.

Net Zero Energy Technologies

The Team evaluated the energy saving and energy producing technologies required to satisfy a net-zero energy performance standard. The evaluation included selecting the

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materials required for the design and construction of the building envelope (i.e. foundation, walls and ceiling), the building components (windows, lighting, etc.), the design of the HVAC system and the size of the solar photovoltaic system. More specifically, the Team selected

- **Double 2x4 Wall System**
  The Team chose a wall system that is used extensively in Alberta, Saskatchewan and the Yukon. The system can be used on both new construction and on net-zero energy retrofits, and it can be assembled on site or prefabricated in a small local shop. This latter characteristic was important as it falls in line with the Cree Nation of Eastmain's plan to construct or rehabilitate facility where wall systems can be assembled locally. Even though prefabricated wall systems have been used in remote communities, the CNE project to create a facility where these can be assembled in a remote community is innovative.

- **Building Components**
  All the building components, including windows, doors, lighting and appliances were carefully selected to ensure that the wall systems would perform to a net-zero energy standard. The Team selected the following components for the NZE program, which will first be used in the construction of the Accessible House
  - Duxton Fiberglass frame, triple glaze, 2-low E coatings, argon filled windows
  - Energy Star certified LED lighting will be installed

- **Solar Photovoltaics**
  As well as being essential to achieving net-zero energy performance, the solar component of the NZE program could potentially satisfy household electrical needs during blackouts. The photovoltaic system that will be used in the NZE houses will be sized according to the net-zero energy needs of each house. All NZE houses will be designed so that the necessary solar panels can be installed directly on the roof of the house.

  In the case of the Accessible House, the solar array (i.e. the number of solar panels) is composed of 45 panels, each producing an output of 330 watts, to meet the energy production target of 14,309 installed watts. Electricity production from the solar array will be tied into the Hydro-Quebec electrical grid. Excess power produced through the solar photovoltaic system will be sold to the grid and bought back from the grid when supply from the system falls below household requirements.

- **Heating, Cooling and Ventilation**
  ReNu Engineering designed the HVAC system to satisfy the heating and ventilation needs of the house while ensuring the house can meet the net-zero energy target. The HVAC equipment includes
  - a VanEE 2400 (with an ECM fan) Heat Recovery Ventilator (HRV)
  - a Fujitsu Halcyon Mini-Split RLS Air Source Heat Pump
  - an AO Smith Proline XE HPTU-66N Hot Water Tank (HWT)

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- **Wood Heat**
  The use of wood heat in residential applications in the North is common. Feedback from residents during the initial consultations on housing designs, many residents suggested using a backup wood heating system that will ensure houses can be heated during power outages. A Droulet Blackcomb air-tight wood stove will be installed in the Accessible House.

- **Smart Home Technologies**
  Equipment that will enable occupants to remotely monitor the operation of their homes, including
  - Z-wave enabled smart home accessories that monitor home security, water infiltration, frozen pipes and carbon monoxide
  - programmable smart thermostats

- **Appliances**

Occupants are responsible for obtaining appliances. However, to assist them with this task and ensure that every component in the house contributes to the net-zero energy target for that house, the CNE will give occupants a list of recommended ENERGY STAR® appliances. The recommended appliances must be affordable while also ranking in the top 20% of ENERGY STAR® rated appliances, a performance level that was determined through the energy modelling exercise. This will include a selection of refrigerators, ranges, dishwashers and washer - dryers.

- **Solar Generated Battery Storage**

Presently, the cost of battery storage for the loads required during the coldest winter months is prohibitive. The cost of solar panels has fallen dramatically over the past 5 years and a similar trend is starting to happen with battery storage systems. The CNE will track developments in the advancement of battery storage technology and expects that, over the next several years, the cost of battery storage will fall significantly. Battery storage will be introduced into NZE houses when the technology and the cost justify its use. When battery storage is introduced, it will be sized to provide emergency support to house operations (limited lighting, fridges, freezers) and enable occupants to survive extended power outages.

Energy and IAQ Monitoring Technologies

Net-energy zero houses constructed under our NZE program will be evaluated even after construction in order to validate their net-zero energy performance. The CNE wants to learn as much as it can from its housing projects to continually improve its housing program. The CNE will carry out extensive energy monitoring of each of the initial housing prototypes and a sampling of future NZE houses. Energy monitoring will include

- blower door testing to confirm air tightness of the building envelope[6]

[6] The Cree Nation of Eastmain NZE program has adopted the "Passive House" airtightness standard (i.e. a minimum air tightness level of 0.6 air changes per hour (ACH) at 50 pascals) as it is considered by net-zero energy builders and energy modellers to be the most rigorous air tightness standard in the industry.

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- detailed data collection over at least one year on energy production from the solar panels
- detailed monitoring of the energy used by occupants, after occupancy, throughout the house including
  - energy consumed by the air-source heat pump and the heat recovery ventilator (HRV)
  - household energy consumption for lighting, cooking, hot water and other uses

For the purposes of the energy monitoring activities to be carried out under its NZE program, the CNE has partnered with the Concordia University School of Engineering's Centre for Zero Energy Building Studies (Concordia). With the technical team, Concordia developed a monitoring protocol and programme and identified the equipment to be used. Measuring the performance of the NZE houses and confirming that they are performing at the net-zero energy standard is a significant component of the performance measurement aspect of our NZE program.

The technologies and equipment for this work are as follows

- Hygrothermal and indoor air quality monitoring equipment including
  - relative humidity and temperature sensors to measure humidity and temperature levels inside the building and its envelope
  - wood moisture content and temperature sensors to determine the moisture level of wood-based materials in the building envelope
  - carbon dioxide sensors to measure indoor air quality
  - a compact weather station to provide local micro-climatic conditions related to temperature, humidity, wind and solar radiation
- a blower door, thermographic camera and other equipment to measure airtightness and detect any perforations in the building envelope
- energy use and production monitoring equipment including
  - a PV energy generation logging device
  - end-use energy use monitoring systems subdivided into heating, ventilation, appliances, lighting and plug loads
  - HRV temperature and flow rate monitoring to determine the HRV efficiency and operation schedule
  - data loggers equipped with backup battery power

In addition to monitoring the performance of the houses, Concordia will carry out research activities on ways to enhance the energy performance of the NZE houses that includes

- installing a building-integrated photovoltaic and thermal (BIPV/T) roof system that involves
  - integrating the photovoltaic system into the roofing material of the building envelope to minimize the amount of building material used and enhance aesthetics

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- ❖ using the cavity between the photovoltaic roof panels as a duct where outdoor air can be drawn and pre-heated for the HRV indoor air intake and monitoring the increased efficiency of the solar panels from the cooling of the panels
- ❖ using the outdoor preheated air to preheat the ventilation air system

- using the insulated thermal mass of the crawl space for thermal storage
- evaluating the benefits of using an automated shading device on windows facing south, west and east as a way to reduce heat gains and the need for air conditioning in summer.

Monitoring equipment will be placed as follows.

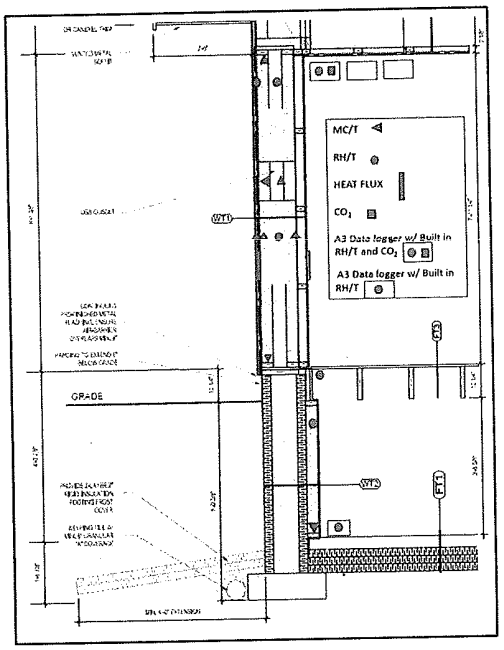
Table 17 – Monitoring Equipment Placement

Location	Equipment
Indoor	A3 wireless CO_2 data logger w/ integrated RH/T (4 resistance channels and 3 voltage channels)
	CO_2 sensor
	A2 wireless data logger w/ built in RH/T and MC
Wall	Point moisture measurement sensor
	RH/T sensor
Attic	A3 NEMA data logger w/ integrated RH/T (4V & 4R)
	RH/T sensor
	Point moisture measurement sensor
Crawl Space	A3 NEMA datalogger w/ integrated RH/T (4V & 4R)
	Point moisture measurement sensor
	RH/T sensor
System	I3 gateway interface
	Building intelligence gateway computer
Roof	Solar radiation sensor
	A2 Wireless Data Logger (with built in RH/T and MC
HRV	Air flow meter
	RTD temperature sensor
	RH/T Sensor
Energy	Watt-hour meter
Outdoors	Weather station

The below figure shows the location inside the house of the performance monitoring equipment.

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Figure 5. Wall section sensor layout.



Building System Assembly Technologies

Specific construction equipment and machinery will be used in the facility that will be constructed or rehabilitated by the CNE for the assembly of building components to be used in the new and the retrofitted NZE houses. This equipment includes

- carpentry and cabinet-making tools like cut-off saws, nails guns and drills
- air compressors
- A skyjack or boom truck
- a bridge crane

Approach to Future Proofing Technologies

All of the technologies being employed in our NZE program are standard and commercially available, selected on the basis of quality, energy performance, cost and simplicity of installation and maintenance. At some point, the equipment will need repair or replacement, however other than these normal foreseeable events, no other issues are anticipated.

The biggest technological challenge arises from the absence of any a local skilled electrical or HVAC tradespeople. This will make the installation and replacement of equipment, as well as routine maintenance and repair, very expensive. To address this issue, the CNE will focus on building capacity locally by training local tradespeople on the installation and maintenance of HRVs and air-source heat pumps. However, this is a long-term plan because HRV technicians must complete a 3-year apprenticeship.

Having chosen to use air-source heat pump technology, the CNE NZE program is vulnerable because it will have to rely on external technicians in the event of breakdowns. All houses are at risk of freezing in the event of heating system failure. However, given the low heat loss expected of the NZE houses and the inclusion of a backup wood heating appliance, these houses should be protected against freezing up and occupants will be able to remain comfortably in their homes until the heating system can be repaired.

Legislative Compliance

All applicable codes and standards were observed in the elaboration of the housing designs. The building system meets the structural requirements of the *National Building Code of Canada* (the "Code"), while dramatically surpassing the energy performance targets of the Code, and complies with other applicable federal and provincial legislation.

Gauging the net-zero energy performance was done using the HOT2000 software developed by Natural Resources Canada (NRCan) and a comparative modelling using the IES VE Energy modelling software. The CNE engaged skilled energy modellers and

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Accessible Design

The Accessible House features were designed to meet the accessibility requirements of the Code and applicable legislation. To create the Accessible House design the CNE drew upon the feedback received during community consultations, including caregivers and first responders. Guides and standards referenced in the design of the accessibility features of the Accessible House include the Canadian Standards Association "Accessible Design for the Built Environment" (CSA B651-12) and CMHC's "Accessible Housing Design Guides" (See Annex H).

Scalability and Replicability

The CNE NZE program is shown to be scalable. The designs and technologies are easily adaptable to respond to the different needs and capacities. The CNE has developed a scalable housing program that offers various sizes of housing to a variety of clientele.

The CNE plans to develop a guide setting out the processes for implementation of future net-zero energy initiatives that can be used as a framework by other Indigenous and non-Indigenous communities.

Technology Partners' Roles and Responsibilities

To design and develop its NZE program, the CNE built a team of skilled designers and technicians with extensive experience in the design, construction and evaluation of net-zero energy housing including

- **Bill Semple, NORdec Consulting and Design**
  Bill led the extensive community consultations carried out to gather input on the design of our NZE program housing prototypes and designed the Six-Plex, the Accessible House, the Cree Elders House, the Private Homeownership unit and the Starter House. Bill led the technical team that carried out the evaluation of the construction details, the net-zero energy modelling exercise, and the selection of all materials and equipment to be used in our NZE program. Bill developed the working drawings for the project and will assist in developing the capacity-building program for the NZE project.

- **Peter Amerongen**
  A leader in net-zero residential construction, Peter led the design of the building system and the net-zero energy evaluation. He identified and selected the materials and equipment required to achieve the net-zero energy and will help with the design of the capacity-building and training program for net-zero building techniques and the assembly facility.

- **Homesol Building Solutions**
  Homesol Building Solutions Inc. is an expert in green building and energy design consulting, energy modeling, ratings, labels and has verified building performance solutions for projects throughout North America. It was responsible for the energy modelling and evaluation of the net-zero energy status of the Six-Plex and the

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used accepted industry software to evaluate energy performance of the NZE houses and confirm that they will satisfy the net-zero energy targets.

The Government of Canada (GOC) is currently developing a "net-zero energy ready" model national building code as well as a model energy code for existing buildings. The CNE NZE program will satisfy the standards established in these codes and, in so doing, lay the groundwork for other Indigenous communities to create energy-efficient housing programs.

Development of Standards and Guidelines

The CNE intends to use the experience gained during its NZE housing program to create local standards and guidelines reflect the innovative combination of technologies, processes and systems that will facilitate the scalability and transferability of its program.

Interoperability of the Technologies

Several standards and guidelines were relied upon to develop the CNE NZE program and to design NZE houses under this program. The CNE has built on these standards and guidelines to create a program that reflects its reality and responds to its needs and capacities. The various standards and guidelines that the CNE referenced in designing its NZE program and the building systems have resulted in new combinations and interoperability between technologies.

HVAC Design

The design of the heating, ventilation and air-conditioning system (HVAC) for the Accessible House drew upon several standards. The air-source heat pump size was based on the HOT2000 load calculations. Heating and cooling loads will be met by a Fujitsu Halcyon Mini-Split Air Source Heat Pump. The sizing of the HRV and design of the duct system was established to meet CSA F326. Finally, rounding out the HVAC system, the CNE will integrate a high-performance, air-tight Droulet Blackcomb wood stove to provide a backup heat source.

Photovoltaic System

The photovoltaic array was calculated as part of the energy modelling exercise for the Accessible House and is based on the energy production requirements needed to meet the net-zero energy target. It was found that a photovoltaic array producing at least 14,309 watts is required for net-zero energy performance. The photovoltaic array will be made up of 45 panels, each with an output of 330 watts. Under Hydro-Quebec's "Net Metering Rate Option for Self-Generators", each of the NZE homes will be connected to the Hydro-Quebec grid and will use net metering. Under the scheme, the Hydro-Quebec grid will become the "storage system" for excess electricity produced by the photovoltaic system and "sold" to the grid. The amount of energy produced will be deducted from the amount used in calculating the household electricity bill.

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- ISO 9001 Quality Management System (QMS) to ensure that CNE meets its community members' infrastructure needs as well as of the SCC solution itself
- ISO/IEC 20000-1 Service Management System (SMS) for the IT services supporting CNE and SCC
- ISO/IEC 27001 Information Security Management System (ISMS) for the protection and monitoring of CNE's information, data, privacy, security, and accessibility.

These systems are enabling CNE to plan, deliver, verify and improve on projects, programs and services. Under the ISO/IMS, the CNE is required to capture stakeholder needs and requirements when designing and developing of any new initiatives, like the Smart Cities Challenge, by using best practices and continuously seeking opportunities for improvement. As an audited, documentation-based system, the ISO/IMS will provide substantiated evidence of the project, from start to finish, making it packageable, transferable and reproducible.

Integrating an ISO/IMS into the SCC is not only novel and innovative in terms of its application of use in this context, but also in terms of its ability to enable CNE to capture and replicate this project to share with other communities. This unique approach will also enable an appropriate level of oversight over the SCC work processes to ensure success at every stage of its implementation. This level of risk management and pursuit of continuous improvement serves as a predictive indicator of failure-causing events, which in turn, makes them easier to avoid.

An investment into a systematic approach at capturing future value in best practices that have been developed within a local community can multiply the beneficial effect across other communities, with structure, discipline, accountability, transparency and quality housing.

Cree Laws and Policies

In this respect, the CNE must comply with the procedures set out in its financial and administrative laws with respect to expenditures and contracting. Budgets must be prepared by the Treasurer and approved by Council. Monies to be allocated to services and programs must be included in the budgets or supplementary budgets and approved by Council resolution. With the exception of borrowing for housing, long-term borrowing must be approved by Council and ratified by the electors of the Cree Nation of Eastmain.

Each year, the CNE is subject to audit of its financial statements. The auditors conduct an extensive examination of Council resolutions, contracts, purchase orders and payments to ensure that spending is done in compliance with the Cree law.

Activities under our NZE program that involve an expenditure of funds must use administrative and financial management tools that ensure the good financial management of resources. These tools include templated contracts, purchase orders, and budgets and financial statements on a project-by-project basis.

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assets. These agreements together provide long-term predictability of funding to the Cree Nation of Eastmain.

Council is the local government authority and has responsibilities set out in the *Agreement on Cree Nation Governance Between the Crees of Eeyou Istchee and the Government of Canada* and the Constitution of the Crees of Eeyou Istchee, as well as under the Cree laws enacted pursuant to these instruments.

ISO/IMS

According to the World Bank, good governance "entails sound public sector management (efficiency, effectiveness and economy), accountability, exchange and free flow of information (transparency), and a legal framework for development (justice, respect for human rights and liberties).[7]" In accepting this definition of governance as one of the underpinnings of community success, the CNE has integrated the spirit of the Smart Cities Challenge. If the CNE promises to adhere to the principles of good governance, it must systematically govern itself. Its strategy, direction, and oversight will only be as effective and as functional as the management systems used to deploy them.

Its acknowledgment of the need for sustainable programs, capable of providing value to the community over time, incited the CNE to develop its ISO Integrated Management System (ISO/IMS) to manage the future growth and challenges of the community. The ISO/IMS provides clear direction and continuous feedback to decision-makers and sets a foundation for trust in the operations of the Cree Nation of Eastmain.

Cree Nation of Eastmain's Smart Cities Challenge governance approach is to integrate the NZE program into the design and development of its ISO/IMS in order to capture its ability to deliver reproducible quality outcomes with a measured degree of reliability. Lessons learned throughout the project, captured as best practices, will be systematically incorporated into NZE program documentation.

Because it is composed of system "modules", the ISO/IMS processes can all be captured and prioritized and implemented in a phased approach to help ensure the appropriate controls, such as transparency, privacy, and accessibility are in place as and when needed.

Through an iterative development approach that sets up the Smart Cities project processes to be executed, together with the capture of their relative performance for continuous improvement purposes, CNE will be developing a turn-key model of not only the housing solution itself, but also of the governance and management systems models that enable them to be sustained.

CNE's governance framework model employs the discipline and traceability of three distinct management systems:

[7] United Nations Economic and Social Council Committee of Experts on Public Administration Fifth session New York, 27-31 March 2006 Agenda item 5 —Compendium of basic terminology in governance and public administration E/C.16/2006/4 *Definition of basic concepts and terminologies in governance and public administration*

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Builders and local tradespeople will be trained in net-zero energy building systems. By participating in the construction of NZE houses, builders and tradespeople will gain first-hand knowledge and net-zero experience. The repetitive application of the net-zero energy construction techniques should lead to a reduction in housing construction costs.

The HVAC Contractor will be introduced to the installation and use of air-source heat pumps and high efficiency HRVs. The air-source heat pump was selected because of its usability and ease of installation and maintenance.

Occupants will be introduced to and be given assistance on the use of the different technologies used in the NZE program. More particularly, occupants will learn to use programmable thermostats and smart home accessories to monitor home security, detect water leakage and track carbon monoxide levels, and online tracking of their energy consumption patterns and energy production through a dedicated website.

If occupants give their consent, the Housing Department may provide on-site support for remote monitoring carried out on the houses such as rebooting computers, changing batteries in the monitoring equipment as needed and mitigating risks. Furthermore, the Department may have access to monitoring equipment and data collected including energy monitoring data, production data and will have access to material cost breakdowns.

Identification of Risks

Data Security

To ensure data integrity, the NZE program data collection system will be able to operate as a stand-alone system to protect the security and integrity of the data without requiring third party analytics software.

There are measures that can be implemented to ensure data integrity and protect it from unauthorized access. Data collected will be communicated to a cloud-based server for analytics and will use a Secure Socket Layer (SSL) to maintain an encrypted link between the web server and browser. Custom access levels to the data can be given such as, read/write to authorized personnel and read only access for open data sharing.

CHAPTER 5: GOVERNANCE

Good governance practices and guidelines are essential to ensuring that government actions are fair and responsible and carried out in an open, transparent and accountable manner. The CNE adheres to good governance principles.

Governance Frameworks and Strategies

The CNE was a signatory to Canada's first modern-day treaty and a number of subsequent agreements reaffirming its right to self-government and to control its land and

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Accessible House. Homesol assisted in the development of the construction details and the selection of mechanical equipment.

- **Concordia University**
  Concordia University's Centre for Zero Building Studies is responsible for the energy monitoring program that will commence with the Accessible House and the NZE retrofit. This will include a breakdown of household energy use patterns including heating, cooling, hot water, appliances, monitoring energy production of the photovoltaic array, monitoring energy production of the air-source heat pump, and monitoring indoor air quality by tracking of CO_2 and humidity levels in the house (See Annex I).

- **McGill University**
  McGill University's Institute of Health and Social Policy will undertake a research project to develop and implement culturally-appropriate research methodologies for monitoring and assessing the results of the NZE housing program at every step. This will include studying the links between housing and individual, family and community well-being (See Annex J).

- **CMHC**
  Canada Mortgage and Housing Corporation provided financial support for the community engagement process and funding for the McGill University research project. In addition, has programs to support ongoing monitoring and evaluation of NZE houses as well as capacity-building. CMHC has acknowledged the importance of the social, financial and technical innovations of our NZE program and expressed interest in the research being carried out (See Annex K).

- **ReNu Engineering**
  ReNu Engineering is an Edmonton company specializing in building performance and energy efficiency. ReNu was responsible for conducting a comparative analysis of different HVAC options and developed the design and conceptual drafting of construction drawings for the selected HVAC system. ReNu also carried out a second energy modelling analysis on the Accessible House to confirm the net-zero energy target using the dynamic IES VE 3D building performance analysis software.

- **Cree Human Resources Development (CHRD)**
  CHRD has funding programs for capacity development that are available to the Cree Nation of Eastmain. CHRD has already contributed financially under its Youth Program that allowed three CNE youth to work with the Project Management Team. The CNE will continue to apply for CHRD funding throughout its NZE program.

Accessibility and Usability of the Technologies

The technologies employed in our NZE program will have a direct and indirect impact on the various stakeholders who will have access to the technologies and the data collected by these technologies.

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Project Management

Under our NZE housing program, Council and the Project Management Team will review program needs and make decisions on project funding on an annual basis and as needed to respond to program requirements. The Project Management Team will have an obligation to report to Council and to the members on the use of Cree Nation of Eastmain's NZE program contributions. All such reporting will be done at public meetings to ensure the transparency of the NZE program activities and enhance the accountability of the Cree Nation of Eastmain.

Our NZE program governance framework will be made up of a two-tier project management system. One tier will manage the NZE program and provide technical support, the other will manage project construction activities and costs. The purpose of this structure is to minimize risks and improve chances of success. All construction projects will be supported by a team of experts making sure that construction can be completed on time and on budget.

The Project Management Team will be responsible for

- obtaining funding for the NZE program and construction activities
- carrying out all design review and changes
- evaluating and approving all change orders
- overseeing all aspects of the NZE program.
- evaluating the project to ensure compliance with building code and other standards
- tracking all materials, orders and costs as well as labour costs
- developing the capacity-building program and overseeing its implementation

The construction project manager will be responsible for

- tendering and contracting with contractors
- establishing and undertaking a material inventory control system
- undertaking the assembly of building components to avoid seasonal impacts
- ensuring construction projects are started and completed on time
- monitoring contract performance
- providing proper site supervision
- controlling costs

Partners and Resource, Capacity, Roles and Readiness

The CNE will work closely with its partners Concordia University, McGill University, Renu Engineering, Canada Mortgage and Housing Corporation (CMHC) and Cree Human Resources and Development. The partners' roles in our NZE program is determined by their respective sphere of activity and expertise. Each of our partners has the capacity needed to contribute to the success of our NZE program.

Concordia University will carry out all the quantitative data collection as well as the storage and protection of this data. McGill University (McGill) will collect qualitative data relating to occupant experience and will also be responsible for the storage and protection of this data. McGill will ensure that data it collects under our NZE program is anonymized prior to disclosure to our program partners or any third party

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CMHC has approved a three-year project for the CNE McGill to carry out qualitative research on the occupants and resident's response to the NZE houses and NZE retrofits. The Contribution Agreement has been approved in principle with wording relating to intellectual property rights and privacy to be finalized.

Concordia University

Concordia University Department of Civil and Environmental Engineering's Centre for Zero Energy Building Studies (Concordia), is one of the leading research institutes on net-zero energy buildings in Canada. Dr. Andreas Athienitis, Director of the Centre and Scientific Director of the Natural Sciences and Engineering Research Council of Canada (NSERC) Smart Net-Zero Energy Buildings Strategic Network, is known at home and abroad for his work promoting net-zero energy buildings. His extensive work in this area has enabled Concordia to build significant capacity in this field, with several professors and graduate students specializing in net-zero energy and solar buildings. Concordia will carry out extensive field monitoring of the houses built under the CNE NZE program which will serve as a model for a framework that can be replicated in other northern communities. Field testing will be carried out by Concordia graduate students, supported by Dr. Athienitis and Dr. Hua Ge.

McGill University

Qualitative research on our NZE project will be carried out by the McGill Department of Geography Institute for Health and Social Policy's Place, Health and Well-being Research Group. Led by Dr. Mylene Riva, Assistant Professor at the Institute and the Department, the research group will examine the social and environmental determinants of health and well-being among Indigenous and non-Indigenous peoples. The extensive field research to be carried out in Eastmain, will build upon a previous project carried out in Nunavik on Housing, Health and Well-being in the Artic. The research activities will be undertaken by graduate students from the Department under the supervision of Dr. Riva. The research work will examine the links between housing and individual, family and community well-being.

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Figure 6. RACI Matrix

Project Deliverables	Council	Project Management Team			External Resources						
		CNE	NORdec Consulting	Ashini Consultants	Concordia University	McGill University	General Contractor	Renu Engineering	CMHC	CHRD	Training Institutions
Net Zero Housing Program Strategy	I	A/R	C						C	C	
Net Zero Housing Program Design	I	A/R	C	C	C	C	C	C	C	C	C
Net Zero Housing Program Implementation	I	A/R	C	R/C	R	R	R	R	I	I	I
Net Zero Housing Program Change Management	I	A/R	C	C	C	C	C	C			
Project Charter	A/R	C/I									
Acquisition of financial resources	I	A/R							C	C	
Funding approvals	A/R	C									
Housing unit design review and changes	I	A	R	R	I	I					
Financial Management	I	A/R					R				
Quality Management		A/R	C	C			I				
Supplier /Contract Management	I	A/R					R				
Risk Management	I/C	A/R	R	R	R	R	R	R			
Ensuring that all standards and applicable codes are followed		A/R					R				
Project change orders		A/R	C	C			I				
Project oversight		A/R	R	R							
Resource control for Pilot		I	C	A/R							
Material negotiations		A/R		R							
Capacity building and training		A				R	R	R	C	C	R
Tendering and issuing of contracts							A/R				
Hiring of trades and subtrades		I	I	I			A/R				
Site supervision							A/R				
Construction cost control		I	I	I			A/R				
Material Inventory Control		A/R	C	C							
Assembly of building components		C	C	C			A/R				
Collection and monitoring of qualitative data		I	C	I		A/R					
Collection and monitoring of quantative data		I	I	I	A/R						
Protection & privacy of quantitative data	R	R	R	R	A/R						
Protection & privacy of qualitative data	R	R	R	R		A/R					
Approval for public release of information	A/R	C									

Control over Sensitive and Personal Data

The CNE and its partners are all responsible for compliance with data protection and privacy obligations.

Data collected in the context of our NZE program will remain the intellectual property of the Cree Nation of Eastmain. The public disclosure of any such information requires the Cree Nation of Eastmain's prior consent.

Any disclosure of information collected under the auspices of our NZE program must first be anonymized and all personal identifying information removed. The CNE intends to enter into memoranda of understanding with its partners, and other person involved in our NZE program, to ensure compliance with the *Personal Information Protection and Electronic Documents Act* (PIPEDA).

Risk Management

Below are some of the risks relating to governance that have been identified along with the steps take to avoid these risks or to remedy them.

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Table 18 – Risk Identification, Prevention and Correction

Risks	Preventive Measures	Corrective Measures
Changes in Council priorities that negatively impact funding commitments for NZE program	Keep Council informed of benefits of NZE program and its importance	Seek additional investment and financing.
Changes to government policies		Adjust the project according
Contract disputes	Ensure effective supplier/contract management is in place	Bring the interested parties together to mediate a solution
Partner withdrawal from the program	▪ Good leadership ▪ Healthy communications to identify issues early ▪ Effective engagement	Establish new partnerships

CHAPTER 6: COMMUNITY ENGAGEMENT

Approach to Engagement

In order to enhance the success of its Housing programs, the CNE is working toward increasing the residents' understanding of its Housing Policies and programs so that they can fully take advantage of these. The Housing Policies are currently being reviewed and during this process, ongoing discussions, information sessions and workshops will be used to educate and gather input from residents on these policies. Community engagement has always been the preferred method for the Housing Department to obtain feedback and ideas from Eastmain residents. Key strategies that we have used to support the Cree Nation of Eastmain's efforts to inform and educate residents include

- developing a Tenant Guide Booklet to be provided to every household
- holding information sessions and workshops for community members on Home Ownership and Tenant Responsibility
- doing monthly Radio Talk Shows on Housing matters
- organizing CMHC-sponsored workshops for tenants and maintenance workers on mould issues, indoor air quality, basic home maintenance, and Section 95 Housing.

Cree Nation of Eastmain's Sustainable City Challenge Statement, "Improving Community Well-Being", evolved from a series of meetings between Chief and Council and the CNE Housing Committee, and numerous informal and formal discussions with elders and other residents. During this engagement process, the CNE became acutely aware of the ongoing issues that residents have with housing designs, construction standards and the operations of mechanical systems. As such, broader consultation was carried out on these issues at community meetings, design workshops and home visits. Community events included

- Workshops/Charrettes (2017 and 2018)
- Annual General Assemblies/Cree Café (2017 and 2018)

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- Meetings/consultations with users (tenants and occupants), and professionals (caregivers, first time responders etc.)
- Special Events
  - Housing Forum (2018)
  - Builders Forum (2018)

Consultations, home visits and workshops were held in June 2017 with the focus of gathering residents' ideas on the design of various housing prototypes. This initial consultation process was followed up by workshops in January 2018 where preliminary plans for the Cree Elders House, the Starter House and the Six-Plex were presented, and residents were invited to comment on these. Consultation was held in the summer of 2018 on the design of the Accessible House.

Annual General Assemblies

The CNE holds regular Annual General Assemblies (AGAs) to receive members' ideas such as topics on ways for improving housing in the community. Break-out groups during the AGAs allow smaller focus groups to explore questions in greater depth.

At the 2017 meeting, the Housing Department presented designs for a Cree Elders' House (Annex L), an Elders' Community (Annex M) and a Starter House (Annex N). A housing booth was set up so members could review the preliminary plans, ask questions and comment on the house designs. The CNE received positive feedback on the designs. Members also expressed their desire to see more durable and energy-efficient homes built in the community. The incorporation of culturally-appropriate features, the installation of solar panels and the use of thicker, better insulated walls were a starting point for further discussions around making houses more sustainable.

CNE Housing Forum

In February 2018, as a continuation of the community engagement process, a Housing Forum, with a focus on obtaining members' input on CNE housing needs and the Smart City Challenge, was held. The Housing Forum was devised to enable the sharing of information and gather members' input on the Smart Cities Challenge, the Cree Nation of Eastmain's proposal to create an NZE Housing Program and the preliminary design for a culturally-appropriate NZE Six-Plex.

Reflecting a trend that is emerging in many northern Indigenous communities, multi-unit housing is being promoted as a means to reduce land development and construction costs, improve energy efficiency and enhance the sustainability of the community. The Housing Forum gave members information and a chance to exchange ideas on

- the Smart Cities Challenge
- the proposed NZE housing program
- energy efficiency targets, technologies and the building systems used to reach these targets

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- lessons learned from other successful NZE projects in Canada
- the challenges facing remote northern communities in attaining NZE targets and their relationship to the traditional lifestyles
- housing design ideas and principles with respect to the proposed culturally-appropriate Six-Plex
- community resiliency and the impact NZE housing can have
- the importance of capacity-building and training to create a sustainable housing program
- the cost/benefit of an NZE program for the Cree Nation of Eastmain
- smart home technologies
- housing maintenance
- views of local builders on NZE building systems

After significant discussion, the CNE members adopted a Resolution supporting CNE's participation in the Smart Cities Challenge. (Annex O) This included the implementation of an NZE Housing Program and the construction of an NZE Six-Plex (Annex P). After the Resolution was adopted, community members were divided into four discussion groups where they provided more detailed input on the Smart City Challenge and the CNE NZE Housing Program.

Cree Cafes and Targeted Consultation

The ongoing use of the Cree Cafés during AGAs and community meetings has led to design innovations and gives residents a means to voice their ideas and share their experiences in respect of housing. It was through this process that the net-zero housing initiative was developed. Input was also sought from service providers in the health care and public safety sectors and, with the ideas of residents, informed the development of several culturally-appropriate housing designs that reflect on the Cree way of life.

Cree Café focus groups broke out during the Housing Forum to discuss questions related directly to the Cree Nation of Eastmain's development of the Smart Cities Challenge proposal. The discussions at the Cree Café confirmed strong support for a net-zero energy housing program, improvement of housing design, durability and operating cost. In particular, there was significant support for

- more design options for homes that will give residents greater opportunity to participate in housing design and that meet the needs of different members
- exploring pre-fab construction that would give the CNE more control over the quality of construction and lead to the creation of more local employment
- home monitoring to help protect homes against break-ins and equipment breakdowns when members are out on the land or travel down south.

The CNE recognized early on during the Smart Cities Challenge community engagement process, that engaging with local builders, to get their input and support, was essential to the success of the project. As part this process, an initial consultation session was

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facilitated by design and technical consultant, William Semple, and net-zero energy consultant, Peter Amerongen, in October 2018. The presentation made to local builders during this consultation session provided information on house designs, the proposed building system, costing, capacity-building issues and the targets for the project. Local builder consultation sessions were used to gather feedback and initial impressions of the NZE program and the challenges and opportunities it would present.

Builders' Forum

Building on the first local builder consultations, an Eastmain Builders' Forum was held in December 2018. The Forum brought together local builders and tradespeople, housing inspectors and representatives from the construction materials supply chain with a view to ensuring the comprehensive representation of the building industry on the NZE program. The CNE took the opportunity to affirm the importance of the participation of local builders and suppliers to the success of the NZE program. More particularly, they were informed that a collaborative and cooperative approach must be taken if the NZE program is to address the ongoing issues with residential construction costs in Eastmain. This further reflected the CNE view that success and sustainability of its NZE program required a holistic approach and the buy-in of all stakeholders.

The Builders' Forum included an overview of the Smart Cities Challenge and the Cree Nation of Eastmain's proposal to establish a net-zero energy housing program to respond to its housing shortage. Participants were presented with the house designs and the proposed building system and technologies.

Builders and industry representatives in attendance expressed strong support for the NZE program and its goals of constructing more, better-built and resilient housing, creating employment and economic development opportunities and building housing industry capacity in Eastmain.

Eastmain Partners Meeting – Concordia University

In January 2019, the CNE and its partners and interested government agencies participated in a two-day meeting and planning session at Concordia University. In attendance were potential funding agencies, research partners and the CNE Smart Cities Challenge team. Presentations included

- CMHC northern housing research projects
- NRC northern research projects
- McGill University social northern housing research in Nunavik
- Concordia University Centre for Zero Energy Building Studies research projects and the NSERC research network

The session also

- developed linkages between the social and technical researchers and research projects

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- provided an overview on the Eastmain Smart Cities Challenge proposal and long-term objectives of the community
- provided an opportunity to contribute to the development of the research objectives of the research partners and input into the development of the final proposal

Community Engagement Plan – Project Implementation

As part of its ongoing consultation process with its members and to support the Smart Cities Challenge initiative, the CNE will carry out ongoing consultation with members and other stakeholders. In addition, the CNE will share NZE program progress and outcomes, and continue to obtain feedback from residents on the NZE program, including the important cultural aspects addressed in the design of the houses. The Cree Nation of Eastmain, in partnership with its research partners, will launch initiatives to gauge the impressions of residents living in NZE houses, with respect to their designs, and the roll out of the construction of NZE housing in the community.

To ensure that Indigenous values, traditions and experiences guide the research, the research project will be conducted according to the principles of Indigenous Research Methodologies (IRM), using research methods for community-based participatory research (CBPR) to engage with Eastmain residents. Using the participatory research model, the McGill University research team will work in collaboration with the CNE. The partners will contribute to the various phases of the research, especially in defining the research questions and objectives, developing the methodologies, data collection and analytical processes, and disseminating the research results. Participatory research will include validation steps at every stage of the NZE program.

For this research to be culturally-sound and grounded in Cree lived-experience, it will engage with Cree worldviews, knowledge and idioms, with a focus on the central role that relationships play in Cree culture. The McGill University research team will conduct one-day workshops with groups of 6 to 12 participants, ensuring representative demographic groups that include women, men, elders and youth. Following the IRM principles, talking circles will be used as a culturally-appropriate way to exchange ideas and bring together varied perspectives on complex subjects. Talking circles will allow the McGill University research team to obtain a comprehensive understanding of the Cree perspective of relationships and how these are impacted by housing conditions and design, and how these housing conditions and designs impact individual, family and community health and well-being.

The IRM principles will guide the research aspect of the NZE program, and data collection methods will be carried out in collaboration with the CNE. The research project will document

- housing conditions and well-being of individuals, families and of the community at "baseline"; i.e. before the implementation of the NZE housing program
- the change in housing conditions, after the implementation of the NZE housing program (i.e. impact assessment of the NZE housing program)
- the impacts on occupants arising from the change in tenancy and occupancy of a new NZE home or NZE retrofitted unit

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- culturally-appropriate and NZE design vs. housing presently available
- NZE retrofitting houses vs. moving into a newly-built house, vs. moving into an existing house in the community made available when other residents move into private homeownership houses

Eastmain Community Housing Meeting (May 2019)

Once the winners of the Smart Cities Challenge is announced and prior to launching the NZE housing program, the CNE will hold a special community meeting and information session. The meeting will provide information on the proposed roll-out of the NZE program including

- a detailed overview of the Cree Nation of Eastmain's final proposal for the Smart Cities Challenge
- the final designs of the houses to be constructed under the NZE program
- a detailed overview of the NZE construction projects to be carried out in 2019
- the proposal respecting the establishment of a warehouse/building component assembly facility
- the project management plan and the proposed timelines for the NZE program

Eastmain Annual General Assembly (August 2019)

At its 2019 AGA, the CNE will provide an update on the results of the Smart Cities Challenge and the roll-out of NZE housing program. A presentation of final drawings and 3-D models of the Accessible House being constructed at the time of the meeting, and the Six-Plex to be constructed in 2020. The information on these construction projects will include (a) the building system, (b) the plans for local assembly of building components, and (c) the net-zero energy monitoring of the projects. The AGA will serve to collect members' feedback on

- proposed project roll-out and construction timelines
- capacity-building and training components and their impacts on local employment
- proposed project monitoring and data collection

Builders Meeting/Workshop (Autumn 2019)

A one-day interactive workshop will be held late in Autumn 2019, after the completion of the Accessible House. The session will include those builders and tradespeople that worked on the Accessible House project. The workshop will consider and make recommendations on

- building system costs, ease of construction, changes or alterations
- pre-assembly of the wall system
- integration of the trades into the production of the house
- evaluation of the material ordering/storage

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- capacity-building and training

Eastmain Community Housing Forum (Autumn 2020)

A one-day Housing Forum will be held in Autumn 2020, after construction has commenced on the first Six-Plex project. The Forum will allow the CNE to get members' impressions on the design of the NZE houses, share results of year-1 monitoring and inform them of the progress of the warehousing and building component assembly facility.

The extensive community engagement initiatives that the CNE has taken on with the NZE program are reflective of the community's ongoing commitment to engage and consult with its residents on important community issues like housing. While the CNE's aspiration to combine the construction of multi-unit homes with NZE performance, culturally-appropriate designs and features is unique and ambitious, the CNE believes the project is achievable – and that extensive community involvement in the project is an important component in ensuring its success.

CHAPTER 7: DATA AND PRIVACY

Preliminary Privacy Impact Assessment

The CNE prepared a Preliminary Privacy Impact Assessment (PIA) showing the consideration it gave to the collection, use and flow of information (See Annex Q). The PIA was sent to the Office of the Privacy Commissioner of Canada for comments. These comments[8] have been considered in the elaboration of the Cree Nation of Eastmain's activities that touch data protection and privacy.

Compliance of Data Management Plan with PIPEDA

Privacy and the NZE Program

The NZE housing program will involve the collection, use and retention of personal information, of varying degrees of sensitivity. The information collected includes *inter alia* the below information (Table 19)

[8] The comments are attached together with Annex R.

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Table 19 – Information Collection and Purposes

Information	Purpose
Name	Identification
Family Size	Allocation of appropriate housing
Address	Identification
Total household income	Determine rent
Health conditions (*if any*)	Determine special housing needs
Rental arrears	Determine eligibility for new housing and/or subsidies
Loan information	Confirm ability to pay and eligibility under Private Homeownership Program
Credit rating	Verify capacity to pay rent

In collecting this information, the CNE intends to comply with fair information principles.

Pursuant to the *Agreement on Cree Nation Governance Between the Crees of Eeyou Istchee and the Government of Canada* and the *Constitution of the Cree Nation of Eeyou Istchee*, the CNE must establish access to information procedures with respect to information in its control. The CNE is implementing a process for classifying information and establishing the level of protection required.

Presently, CNE agreements with suppliers, contractors and consultants contain provisions respecting confidentiality and, with respect to service providers, retention and disclosure restrictions.

With respect to the NZE housing program, both Concordia University and McGill University[9] are subject to their own privacy policies and to the Quebec *Act respecting access to documents held by public bodies and the protection of personal information,* CQLR ch A-2.1. Concordia University's Office of Research will provide guidance to the CNE to ensure research conducted under our NZE program complies with all applicable legislation and policies. A Summary Protocol Form will be submitted to the Concordia University Human Research Ethics Committee (UHREC) to obtain a Certificate of Ethical Acceptability before undertaking any monitoring of any occupied houses. Annual progress reports will be submitted to UHREC to obtain approval of the research privacy and data protection protocols throughout the monitoring phase.

A consent form that contains a plain language description of the project and any possible privacy risks will be given to occupants as part of the consent process.

Methods of Data Collection, Analysis and Storage

The CNE has held public meetings with its members to design the NZE housing program. As well, housing continues to be tabled at public meetings. Members are informed regularly of the information requirements for housing in general, which includes much of the information set out in Table 19.

[9] McGill University is subject to the Tri-Council policy Tri council policy statement http://www.pre.ethics.gc.ca/eng/policy-politique/initiatives/tcps2-eptc2/chapter9-chapitre9/

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New regional policies will be coming into force and the NZE housing program will involve further consultation with members to ensure comprehension of the additional information requirements of the regional policies. The CNE will also inform members of the type of information that will be required and the purpose of collection of information under the NZE program. Prior to the collection of information, the individual is informed of the reasons for which the information is collected, how it will be used and whether it will be shared with other organizations.

Table 20 – Non-personal Information Collection and Purposes under NZE Program Monitoring

Information	Purpose
House Model/Size	Research
Energy use	Research
Air quality	Research
Comfort	Research
Satisfaction	Research

Collection

The CNE Housing Administrator will collect only that information required for the purposes of administering the NZE housing program and complying with the CNE housing policies and the policies to be adopted by the Cree Nation Government. More specifically, the CNE must, in order to administer its NZE program, be able to identify the occupants, verify their eligibility under the programs and capacity to pay and understand the health conditions, if any, that may be determinative on the type of housing unit allocated to the occupants.

The information collected by Concordia University and McGill University is necessary to enable the analysis of the net-zero energy technologies, construction systems and to measure the success and individual satisfaction with the NZE homes to be built in Eastmain.

Use, Disclosure and Retention

The information collected by the CNE will be used exclusively for the purposes of administering its housing program; i.e. allocating housing units, fixing the rent to be paid and establishing maintenance schedules, amongst others. Information collected by Concordia University and McGill University will be used solely for research purposes.

The information collected by the CNE will not be disclosed to third parties except as required by policy. Disclosure to the Cree Nation Government may be required under CNG policies and funding arrangements with the CNE, so that the occupant or the CNE can access subsidies for housing. Otherwise, the CNE will not disclose information collected from members for the administration of its program to third parties.

The CNE will however collect information generated by the sensors and data loggers. This information will be anonymized and then transmitted to Concordia University for the

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purposes of monitoring the performance of the NZE houses. McGill University will be responsible for collecting information directly from occupants of NZE houses and Eastmain residents with respect to the qualitative study it will conduct.

The information collected under this study will not be disclosed to third parties, including Cree Nation of Eastmain, until it has been anonymized.

Depending on the housing program, and the type of information collected, information collected for the purposes of administering the housing program is held for the duration of the housing project (i.e. until final payment) or until it is no longer relevant (such as a change of occupant).

McGill University may retain information for up to 20 years under its policies. This information though will be in an anonymized format.

Security and Privacy Considerations

The CNE is implementing information and data management protocols to ensure that personal and confidential information are properly collected, managed and stored. Given the feedback from the Office of the Privacy Commissioner, the CNE will require partners to enter into agreements that provide for the protection of personal and non-personal confidential information.

Adherence to Fair Information Principles

Governance

The CNE is committed to ensuring that personal and confidential information collected under its NZE program is treated in compliance with the *Personal Information Protection and Electronic Documents Act*. The CNE is implementing an Integrated Management System auditable to ISO Standards; 9001:2015 Quality Management; 20000-1:2011 Information Technology Service Management; and 27001:2013 Information Security Management.

It is also noteworthy that developing a privacy and data protection policy is a priority of the CNE. Recognizing the vast amounts of personal, employee, business and confidential information it handles regularly, the CNE plans to ensure that information is properly classified. Classification of the information it collects, uses and processes will ensure that, through policies, the CNE can establish the appropriate protection of that information and define access and disclosure restrictions.

Ownership and Control

Personal information required under its housing program will be owned and controlled by the CNE. In fact, where third party services are required to process the information, the CNE standard contracts contain clauses ensuring that any information obtained or processed by the third party remains the property of the CNE. More importantly, the information cannot be accessed directly by the third party on the CNE information system

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without first obtaining the necessary authorizations. The authorization is given in the form of a letter that must set out the purpose of the access and the period of access.

In the NZE program, the CNE will also retain ownership and control of the data generated by the sensors and data loggers installed in NZE homes for monitoring purposes.

Consent

The CNE collects and holds information relating to members under other programs, including member benefits and elections. However, there is no information sharing between departments and programs unless the member expressly consents to disclosure of this information.

The name and address of occupants as well as information relating to membership are generally publicly known given the size of Eastmain. While the CNE may have a general understanding of certain health conditions, this information must be obtained directly from the individual or, if incapable, from that individual's caregiver with express consent.

Under the NZE program, CNE will only collect information from occupants of NZE houses or NZE retrofits, as required by the regional and CNE housing policies. This involves collecting personally-identifying information and information relating to occupants' financial situation directly from occupants. Prior to collecting this information, the CNE will ask occupants to consent to the collection of their personal information, using a consent form developed for the Housing Department needs. Pursuant to CNE practices, occupants must also consent specifically to the further sharing of information.

Occupants of NZE houses and NZE retrofits will also be asked to consent, on a voluntary basis, to the collection of information generated by the sensors and data loggers installed in the NZE houses and retrofits and will be told the purpose of such collection. Consent must be given in writing and will be related solely to the research conducted by Concordia University. The information will include addresses and other personally-identifying information collected by the CNE.

Concordia University will also request the consent of occupants participating in the NZE program monitoring. The consent form will explain in plain language that consent is given on a voluntary basis, with the option to withdraw at any time.

McGill University will collect information through one-on-one interviews, surveys and questionnaires. Occupants of NZE houses will be given a questionnaire each year. All collection and use of the data obtained through these methodologies will be subject to the consent of the occupant and McGill University must pass all research by the Ethics Committee to ensure that it conforms to McGill University's policy on protection and retention of personal information[10].

[10] *Ibid.*

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Data Minimization and De-identification

Information relating to energy use and production is non-personal information generated by the sensors and data loggers installed in NZE homes and retrofits and will be collected by the CNE Housing Department. The information will include the addresses of the homes, but this information will be removed before transmission of the non-personal energy use information. The CNE will anonymize all information before it is transmitted to Concordia University for the purposes of its study.

Access

Because personal information is collected for the purposes of administering the NZE housing program, it is important that it be accurate and up-to-date. Under CNE policies personal financial information must be updated every two years to ensure its accuracy. Individuals may also periodically update or modify their information by making a request to the Housing Department.

Under the *Constitution of the Cree Nation of Eeyou Istchee*, the CNE must set up a process to respond to access to information requests. This will include identifying the person who will respond to such requests. Presently, members attend the CNE administration offices to request access to information and documents held by the CNE.

Individuals may access information pertaining to them to ensure its accuracy and make corrections. Generally, this is done directly with the department holding the information.

Security

The information held by the Housing Department is kept in locked cabinets and password-protected computers to ensure information is adequately protected and can only be accessed by those administering the housing programs.

The CNE is sensitive to the need to protect the privacy of residents. By classifying information and setting access rights accordingly, it will restrict access to personal information it receives from occupants under its housing programs.

All information collected by McGill University will be anonymized. The names of study participants will be kept in separate password-protected files. Each participant will be attributed a number to prevent their identification. McGill University is alive to the risk that some participants will be readily identifiable solely on the basis of their comments or responses and will look for ways to mitigate. All information is kept in a password-protected computer in a research lab that can only be accessed with a code.

The NZE houses will be equipped with connective technology allowing Concordia University to monitor and measure field data and performance data. The data generated through the monitoring equipment will be sent by the CNE to Concordia University using Secure Socket Layer (SSL). This will ensure an encrypted link is maintained between the web server and browser and prevent cybersecurity breaches that would put the data at risk of unauthorized access or unintentional disclosure.

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Open Data Strategies

The CNE has embraced an open, transparent data strategy aimed at ensuring ongoing communications with Eastmain residents on the NZE program. The level of consultation and community engagement has been extremely high and will continue under the NZE program.

Open data strategies will ensure that Eastmain residents have access to the results of the studies being conducted by Concordia University and McGill University.

Through smart technologies installed in NZE houses, occupants will have access to information relating to their energy use and production, energy use patterns and indoor air quality of their houses. These technologies are commercially available which means that they are easily transferable and reproducible in other projects and communities.

Risks

Table 21 – Risk Analysis

Risks	Preventive Measures	Corrective Measures
Accidental/intentional disclosure of personal information	Keep hard copy information in a secure, locked location Password protect computers and computer files	Inform occupants of breach Impose secure storage and password protection protocols
Identification of occupant from responses to McGill questionnaire	Phrase responses to avoid identification Explain to respondents the risk of identification	Remove response from published study
Accidental/intentional disclosure of health information	Keep hard copy information in a secure, locked location Password protect computers and computer files	Inform occupants of breach Impose secure storage and password protection protocols
Accidental/intentional disclosure of financial information	Keep hard copy information in a secure, locked location Password protect computers and computer files	Inform occupants of breach Impose secure storage and password protection protocols
Decision-making based on out-dated or inaccurate information	Ensure information is updated regularly Ask occupants to provide updated information	Correct information

CHAPTER 8: FINANCIALS

The CNE has extensive experience in managing capital projects, from securing funding and managing costs, to completion of various multi-million-dollar projects undertaken over the last ten years. Projects included construction of public facilities, infrastructure and housing. CNE benefits from some of the most up-to-date technologies to manage its projects including GIS, Accounting and Cost Control Systems, Preventive Maintenance, Project Management and Document Management Systems, that are linked together to improve efficiency. Our IT systems will soon be updated to a hyper-converged infrastructure that permits multiple servers to act as one which improves scalability, data protection, management, maintenance and operational activities.

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As a Cree local government, the CNE is required to follow the Canadian public sector accounting standards prescribed for governments as recommended by the Public Sector Accounting Board of the CPA Canada with exceptions of certain requirements as agreed by Canada and as detailed in our annual Independent Auditors Report. CNE management is responsible for the integrity and objectivity of financial statements and for implementing and maintaining a system of internal controls to provide reasonable assurance that reliable financial information is produced. CNE's Council is responsible for ensuring that management fulfills its responsibilities for financial reporting and internal controls and is ultimately responsible for reviewing and approving the financial statements.

Local companies in Eastmain, working with external skilled tradespeople for plumbing, electrical, heating and ventilation, will be constructing and retrofitting the NZE units. The CNE will be responsible for securing all funding and issuing contracts to Stajune Construction for project management and cost control of the construction works on a fixed-cost basis throughout the program. The CNE will also be responsible for monitoring the overall NZE program, risk management, the purchasing and negotiating with suppliers for all construction materials and the control of inventory.

Project Budget

Funding for the CNE NZE program has been secured, with the exception of the Smart City Challenge winner's prize, and revenues generated from the sale and leasing of housing units. The CNE will continue to apply under any funding programs that can benefit the NZE program.

Revenues

Details of our secured and projected revenue sources are as follows

- **Cree Nation of Eastmain**
  The CNE will contribute up to $5M from its Local Economic Development Fund over a six-year period for the NZE program activities, matching the SSC prize if CNE is chosen as the winner
- **Infrastructure Fund**
  Funding comes from an annual subsidy provided to the CNE through the regional government for housing and infrastructure purposes
- **Housing Action Plan**
  These funds are received from the regional government for urgent mould remediation and housing renovations
- **Regular Program Subsidies**
  Grants from the regional government help off-set the high costs of construction in Eeyou Istchee
- **Smart City Challenge**
  The prize awarded to the winner of the Smart Cities Challenge $5M category

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- **Sales and Rent**
  The monies received from the sales of the NZE private homeownership houses and the monthly rent collected from tenants occupying rental housing units
- **Training and Development**
  Revenues secured by the CNE to date from outside sources that have programs designed to build capacity in Indigenous communities

Expenses

Expenses for our NZE program are costed in today's dollars and exclude possible year-to-year inflationary increases that would normally apply to construction labour and materials. The CNE believes that as it gains experience in net-zero building techniques, efficiencies will off-set annual inflation numbers. Also, costing for material was based on northern norms and excludes potential savings that may be generated by bulk ordering materials and establishing and improving CNE's supplier management processes and the relationships within the supply chain.

CNE NZE program projected expenses are

- **Accessible Housing Unit**
  Construction costs for building an Accessible House pilot unit in year-1 of the NZE program
- **Multi-Client Six Plex**
  Construction costs for building 5 Six-Plex buildings over a five-year period between year-2 and year-6 of the program
- **Detached Single Family Unit**
  Construction costs for building 4 single-family houses in year-2 through year-5 of the NZE program (this excludes the pilot Accessible House). Year-2 and year-4 will see a 2-bedroom Starter House built and a 3-bedroom Private Homeownership House will be built in year-3 and an Elders House built in year 5
- **NZE Retrofit**
  Expenses are related to carrying out a net-zero retrofit pilot in year-1 and retrofitting 4 units in year-2, and 5 retrofits each year for years 3 to 6
- **Training and Development**
  These expenses represent the estimated costs for training and work experience programs for construction workers in relation to net-zero building and potential CNE contributions to qualify community members in the skilled trades of plumbing, electrical, heating and ventilation
- **Program Administration**
  These expenses are related to CNE project oversight and personnel required to ensure overall success through continuous program marketing, operational support by technical experts, professionals and applying for additional resources to extend projects beyond the Smart Cities Challenge
- **Solar Technologies**
  The Cost "B" estimate for the Accessible House, based on the energy modeling exercise used to determine the size of the photovoltaic array needed to produce

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the electricity requirements to reach net-zero status. This number was used to determine the average number of photovoltaic panels per unit being built and retrofitted per year.

SMART CITY CHALLENGE----Net Zero Energy Housing Program

Proforma Financial Statements

	Year Ended 31-Mar-20 Proforma $	Year Ended 31-Mar-21 Proforma $	Year Ended 31-Mar-22 Proforma $	Year Ended 31-Mar-23 Proforma $	Year Ended 31-Mar-24 Proforma $	Year Ended 31-Mar-25 Proforma $	Totals $
Revenue:							
Cree Nation of Eastmain	100,000	900,000	1,000,000	1,000,000	1,000,000	1,000,000	5,000,000
Infrastructure Fund	147,912	20,112	20,112	20,112	20,112	20,112	248,472
Housing Action Plan	196,790	196,790	196,790	196,790	196,790	196,790	1,180,740
Regular Program Subsidies	127,800	633,200	674,600	633,200	544,800	544,800	3,158,400
SMART Citites Challenge winner's prize	517,285	1,160,551	1,225,331	1,063,633	1,033,200	-	5,000,000
Sales and Rent	3,000	871,956	871,956	871,956	871,956	598,876	4,089,700
Training and Development Fund	27,563	13,782					41,345
Total Revenue	**1,120,350**	**3,796,391**	**3,988,789**	**3,785,691**	**3,666,858**	**2,360,578**	**18,718,657**
Expenses:							
Accessible Housing Unit	276,743	-	-	-	-	-	**276,743**
Multi-Client Six Plex	-	1,823,308	1,823,308	1,823,308	1,823,308	1,823,308	**9,116,540**
Detached Single Family Unit	-	320,446	348,419	320,446	312,959		**1,302,270**
NZE Retrofit	177,565	710,260	887,825	887,825	887,825	887,825	**4,439,125**
Training & Development	50,000	35,000	25,000	15,000			**125,000**
Program Administration	325,550	325,550	325,550	325,550	325,550	325,550	**1,953,300**
Solar Technologies	50,000	275,000	300,000	300,000	300,000	275,000	**1,500,000**
Total Expenses	879,858	3,489,564	3,710,102	3,672,129	3,649,642	3,311,683	**18,712,978**
EXCESS (DEFICIENCY) OF REVENUE OVER EXPENSES	240,492	306,827	278,687	113,562	17,216 -	951,105	**5,679**
FUND BALANCE-BEGINNING OF YEAR	-	240,492	547,319	826,006	939,568	956,784	
FUND BALANCE-END OF YEAR	**240,492**	**547,319**	**826,006**	**939,568**	**956,784**	**5,679**	**5,679**

Figure 7. Proforma Financial Statements

The proforma financial statements does not reflect the bulk ordering of all construction material (excluding electrical, plumbing, heating and ventilation) which will be purchased by Stajune Construction in the Fall of year-1, for construction projects to be carried on in year 2 and every subsequent year.

Figure 8. Quarterly Expenses per Year.

CASH OUT SPLIT BY QUARTER AND YEAR

Year/Quarter	Q1	Q2	Q3	Q4	Total expenses per year	Other Expenses maintenance:	Total Cash Out per year
2020			$ 617,075.00	$ 262,783.00	$ 879,858.00		$ 879,858.00
2021	$ 537,214.50	$ 537,214.50	$ 1,247,790.50	$ 1,167,344.50	$ 3,489,564.00		$ 3,489,564.00
2022	$ 537,214.50	$ 537,214.50	$ 1,354,546.00	$ 1,281,127.00	$ 3,710,102.00		$ 3,710,102.00
2023	$ 537,214.50	$ 537,214.50	$ 1,316,573.00	$ 1,281,127.00	$ 3,672,129.00		$ 3,672,129.00
2024	$ 537,214.50	$ 537,214.50	$ 1,294,086.00	$ 1,281,127.00	$ 3,649,642.00		$ 3,649,642.00
2025	$ 537,214.50	$ 537,214.50	$ 981,127.00	$ 1,256,127.00	$ 3,311,683.00		$ 3,311,683.00

Class B Methods and Assumptions

As the CNE NZE program is primarily comprised of capital projects relating to construction, the below Figure 9 was used as the basis for construction Class "A" through "D" estimates.

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Figure 9. Construction Class Estimates

Class of estimate	Design Estimate Effort	Project Contingency Range (%)		Cost estimate basis	
				Materials	Labor
		(-)	(+)		
A	Finalized (100% complete tender documents)	5%	10%	As for Class B, with material on approx. 100% firm basis	As for Class B, some actual field labor productivity may be available
B	Detailed (66%Design development)	10%	15%	Firm unit cost quotes based on detailed quantity take-off	Estimated man-hour units (including assessment) using expected labor rate for each job classification
C	Preliminary (33%Design development)	15%	20%	Labor/material ratios for similar work, adjusted for site conditions and using expected labor rates	
D	Concept (simplified)	20%	30%	By overall project or by ratio to area or global project unit and comparison with similar work with materials adjusted to current cost indices and labor adjusted to site conditions.	

Estimates were realized by an Indigenous engineering firm involved in Indigenous construction projects and are specialised in construction project management. These estimates were based on completed preliminary design drawings, including definition of major systems and subsystems and outline specifications. These documents were prepared by an Architectural Technician under supervision of the Designer and a net-zero builder. The estimates include documented work breakdown and quantities calculations. Rough material prices used for the estimates were provided by a regional supplier. Mechanical equipment and other material prices were based on budget bids obtained from various suppliers. Realistic assumptions were made on labour productivity. Labour rates were based on rates established by the Commission de la construction du Québec and the estimated ratios of local and external tradespeople. Finally, estimates were cross-checked by using a unit price method based on similar project experiences.

Contributions from other Sources

The CNE NZE program will leverage revenues generated as set out above, other contributions and the Smart Cities prize money to amplify the impact and reach of our program by

- applying for additional provincial and federal funding geared toward enhancing accessibility for persons with disabilities
- obtaining in-kind contributions and/or financial assistance from our partners and government programs including
  - ❖ the Concordia University Centre for Net-Zero Energy Building Studies in-kind and financial contributions through funding received from (NSERC) that supports its net zero research projects and initiatives

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- McGill University research carried out under a research grant funded by CMHC under its Research Planning Fund (RPF) (See Annex – Letter of Approval)
- Cree Human Resources Development is subsidizing the salaries of three local youth to assist CNE with project coordination and proposal development
- CMHC is contributing funding under a youth work experience program in relation to research and team environment initiatives via a grant through the Housing Internship Initiative for First Nation and Inuit Youth program (HIIFNIY)(See Annex *)

The CNE's project management team will continually apply to funding programs and other revenue sources to leverage success. This includes any local, regional and national programs that support Indigenous and accessible housing, green technologies, capacity building, smart technologies and research that captures net-zero development and the human experience related to our project to ensure sustainability beyond the Smart Cities Challenge.

With that said, this Smart Cities Challenge has already yielded success for the CNE. The CNE approached housing holistically from a 360-perspective for the comprehensive engagement of all stakeholders including community members, academia, industry experts and the supply chain. By undertaking this approach with a more fulsome consultation of the supply chain and industry stakeholders, the CNE was able find significant savings compared to the way business was normally done. In fact, detailed costing of the CNE prototypes was initially estimated at $3M for the Six-Plex however the Class B estimates for the Six-Plex came in under $2M resulting in greater affordability per unit. This cost savings also applies to all other new units built under our program.

Financial Tools and Methodologies

Fund accounting is the financial methodology used by the CNE that results in a self-balancing set of accounts for each fund established by legal, contractual or voluntary actions. Transactions are accounted for under five different funds established by laws. The accounting software, Sage 300, as well as Committed Cost systems are used for the financial operations. Those systems enable the CNE to account for expenses by department at the General Ledger level. The departments represent projects for the Special Projects Fund, the same applies to the General Operation Fund and the Capital Additions Fund.

Committed Cost systems enable the issuance of purchase orders related to specific projects taking into consideration the available budget per account and fiscal period. This information is transferred into Sage 300 in order to provide reporting per project including actual costs, budgets as well as commitments. The financial plan for our NZE program is based on budgeted cash flows on an accrual basis.

Project management implementation will use MS Project along with the principles outlined by the Project Management Institute (PMI) for project management and with cost

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accounting methodologies managed through Sage 300. The CNE will further ensure proper project management by implementing all aspects of our ISO/IMS.

Risk Identification and Mitigation

Below are the risks identified by the CNE with respect to the financial operations of its NZE program.

Table 22 - Risk Analysis

Risks	Preventive Measures	Corrective Measures
Cost overruns	▪ Implement contractor/supplier management best practices ▪ Hire an experienced construction project manager and site supervisor ▪ Conduct audit on all construction and project management processes	▪ Adjust project scope and budgets ▪ Identify root cause and implement audit findings to improve efficiency
Unable to sell units as individuals can't qualify for a mortgage	Pre-screen and pre-qualify parties	▪ Identify additional purchasers ▪ Re-classify a 'for sale' unit as a conditional rent to own until the potential purchaser can qualify for a mortgage
Construction company unable to secure necessary resources for construction	Assist companies in securing capital funds on a project by project basis	▪ Foster partnerships and joint ventures between companies to improve their financial capacity ▪ Directly manage the project through Eastmain's development corporation ▪ Increase CNE's investment into the project
Cost of constructing net zero homes is too expensive in Eastmain	▪ Scale project to "net-zero ready" energy performance ▪ Identify and secure federal and/or provincial green energy subsidies to offset the cost of the alternative energy systems (e.g. solar) ▪ Redesign units to accommodate a smaller living space	▪ CNE develops an in-house green energy subsidy program ▪ Re-evaluate and redesign the construction system ▪ Build smaller units ▪ Enter into agreements with companies that result in lower profit margins in exchange for project guarantees
Insufficient rent collection on rental units to help support operation and maintenance and reinvestment into future construction	▪ Pre-qualifying renters by verifying their credit history ▪ Request rental deposits ▪ Verify capacity to pay ▪ Credit bureau reporting ▪ Ensure rental agreements are fair and drafted to look after the best interests of both parties while protecting the investment of the property owner	▪ Terminate occupant's rental agreement as a result of failing to pay and evict the tenant ▪ Amend rental agreement to require a co-signer whom would also be liable for any rental arrears ▪ Institute penalties through forfeiture of local subsidies and automatically apply grant to rental arrears ▪ Suspend eligibility for local grants, loans and subsidies to persons with rental arrears ▪ Take legal action
Negotiations with the supply chain are not successful in reducing the current cost of materials	▪ Pre-discussions with suppliers with regards to what we are trying to achieve with the SCC to foster win-win relationships ▪ Expand the list of suppliers that are approached	Re-tender the ordering of materials

Finalist Grant Report

The CNE supplemented the finalist grant with funds from its operations and partners to help offset the costs associated with project coordination, proposal development and the activities needed to design and build its systems and costing. The finalist grant funding was used along with CNE funds to develop the final proposal. Detailed use of those resources are as follows:

- **Project Coordination**

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Expenses for the assignment and reassignment of CNE personnel to coordinate all project activities through the project management team

- **Stakeholder Engagement**

  Sessions were regularly held throughout the project development phase to acquire technical information and clarify expectations and roles of all stakeholders while obtaining feedback from the community members and all other interested parties

- **Proposal Development**

  Costs related to CNE staff time as well as the effort put forth in organizing information and assistance by partners to draft the final proposal

- **Building Designs and Systems expenditures** (architecture, energy modelling, engineering)

  Refining the designs of each of the housing prototypes that were developed based on extensive consultation with community members and resulted from energy modelling exercises and consultation with net-zero and local builders and the housing materials and equipment supply chain

- **Data Modelling**

  These costs were for the data modelling exercises required to determine the building system and technologies required to meet net-zero targets as part of the design process

- **Plans, Specs and Costing**

  These were incurred in developing the working drawings, design of the HVAC system and solar systems, analysis and selection of accessible housing equipment, and selection of the household lighting and other equipment

- **Jury Meetings**

  The costs for travel, lodging and per diem relating to meeting with the SCC Jury in Toronto to represent CNE's project and answer questions posed by the Jury.

Our project had a minor deviation regarding the original application. We decided to extend the project from five years to six years in order that year-1 could serve as a pilot year to ensure detailed costing is obtained through extensive project oversight and to identify true costs versus billed costs. The pilot year will be used to account for actual costs of material and labour to ensure data is available to properly analyse actual costs within the environment. This information will give policy makers data that reflects the northern reality thus enabling them to make informed decisions.

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Figure 10. Finalist Grant Financial Report

SMART CITIES CHALLENGE FINALIST GRANT

Project Revenues:

Smart Cities Challenge Finalist Grant	$ 250,000
Cree Nation of Eastmain	73,344
CMHC-HIIFNIY Fund	36,000
CHRD	27,563
Total Revenues	**$ 386,907**

Project Expenses:

Fiscal Year	**2018 - 2019**				**Total**
Financial periods	***Qrt 1***	***Qrt 2***	***Qtr 3***	***Qtr 4***	
Project Coordination	$ 1,500	$ 7,807	$ 12,194	$ 43,192	$ 64,693
Stakeholder Engagement Sessions:					
Community Members		11,666	4,050		15,716
Partners		1,757	12,759	1,500	16,015
Contractors and Suppliers			17,966	12,600	30,566
Proposal Development	18,807	8,100	15,136	107,392	149,435
Building Designs and Systems	13,376	3,450	31,831	16,100	64,757
Data Modeling			-	6,609	6,609
Plans, Specs and Costing			6,500	18,820	25,320
Jury Meetings			13,796		13,796
Total Quarterly Expenses	**$ 33,683**	**$ 32,780**	**$ 114,231**	**$ 206,213**	**$ 386,907**

Other Details

Class B estimates were established for the pilot construction of the Accessible House (first single-family house) and for the Six-Plex. A Class "B" estimate for the Six-Plex was derived from the detailed section, plans and elevations of the Six-Plex, and the costing for construction details and mechanical systems of the Accessible House (as these are the same construction details that will be used in all the NZE houses). For all other aspects of our project, Class "D" estimates will be used until building systems have been finalized and lessons learned from the pilot projects are applied. Plans and specs for Class "A" estimates for the tendering of the Accessible House will require identifying the specific exterior and interior finishing materials (flooring, lighting, etc.) and household equipment for the house.

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Table 23 – Detailed Costing of NZE Program

Detailed Cost (accessible house)				
		Unit Price	Quantity	TOTAL COST
FIXED ASSETS	Accessible Housing Unit	$232.52	1,190	$ 276,700.00
	NZE Retrofit	NA	NA	$ 177,600.00
	Multi-Client Six Plex	$222.76	8,185	$ 1,823,300.00
	Single Family Unit	$ 219.15	1,463	$ 320,500.00
	NZE Retrofit	NA	NA	$ 710,300.00
	Multi-Client Six Plex	$ 222.76	8,185	$ 1,823,300.00
	Single Family Unit	$238.22	1,463	$ 348,400.00
	NZE Retrofit	NA	NA	$ 887,800.00
	Multi-Client Six Plex	$ 22.76	8,185	$ 1,823,300.00
	Single Family Unit	$ 294.04	1,090	$ 320,500.00
	NZE Retrofit	NA	NA	$ 887,800.00
	Multi-Client Six Plex	$ 222.76	8,185	$ 1,823,300.00
	Single Family Unit	$ 231.85	1,350	$ 313,000.00
	NZE Retrofit	NA	NA	$ 887,800.00
	Multi-Client Six Plex	$ 222.76	8,185	$ 1,823,300.00
	NZE Retrofit	NA	NA	$ 887,800.00
	Training & Development	NA	NA	$ 125,000.00
	Program Administration	NA	NA	$ 1,953,300.00
	Solar Technologies	NA	NA	$ 1,500,000.00
TOTAL				**$ 18,713,000.00**

Note: The values are rounded.

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Class B Estimates for CNE NZE Program

Figure 11. Accessible House

Project: Accessible House
Project Nu : 028-19011
Prepared by : Jean Larouche
Type : New building
Location : Eastmain
Date: March 4th 2019
Revision 3

ID	Qty	Description	unit	PU	Material	Labor	Man-hours	Sub-total	Contingency Class B -10%	Contingency Class B 15%	Notes
1	1	Water input	gl	4 850,00 $	3 395,00 $	1 455,00 $	21	4 850,00 $	4 365,00 $	5 577,50 $	
2	430	Excavation/ embankment	m3	31,50 $	9 481,50 $	4 063,50 $	58	13 545,00 $	12 190,50 $	15 576,75 $	Mat included excavation equipement
3	7,5	**Foundations**	m3		10 686,53 $	15 800,00 $	214	25 686,53 $	23 117,88 $	29 539,51 $	Concrete : 300$/m3, mat includes pump
3,1	6	Main footing	m3	1 017,50 $	- $	- $	-	- $	- $	- $	
3,2	1,5	Isolated footing	m3	1 003,50 $	- $	- $	-	- $	- $	- $	
3,3	725	Isolated fundation walls	sq2	32,73 $	- $	- $	-	- $	- $	- $	
4	1240	**Building exterior walls**	sq2								
4,1	1240	Structure and insulation	sq2	11,28 $	6 708,40 $	5 015,80 $	72	11 724,20 $	10 551,78 $	13 483,83 $	
		Insulation			2 256,80 $	- $		2 256,80 $	2 031,12 $	2 595,32 $	
4,2	1300	Outdoor siding (Canexel)	sq2	8,35 $	4 134,00 $	6 591,00 $	94	10 725,00 $	9 652,50 $	12 333,75 $	
4,3	1	Doors and windows (triple verrai)	gl	21 725,00 $	12 926,38 $	5 539,88 $	79	18 466,25 $	16 619,63 $	21 236,19 $	1 bid
5	1200	**Main floor**	sq2								
5,1	1200	Structure	sq2	7,54 $	4 272,00 $	3 600,00 $	43	7 272,00 $	6 544,80 $	8 362,80 $	
5,2	1200	Flooring	sq2	7,45 $	4 023,00 $	4 917,00 $	70	8 940,00 $	8 046,00 $	10 281,00 $	Includes ceramic and vinyl (no price from rona for material)
6	2100	**Roof**	sq2								
6,1	2100	Structure and insulation	sq2	11,83 $	10 790,00 $	14 042,50 $	201	24 832,50 $	22 349,25 $	28 557,38 $	Includes lifting equipement
		Insulation			1 781,00 $			1 781,00 $	1 602,90 $	2 048,15 $	
6,2	2100	Roofing	sq2	3,81 $	1 785,00 $	3 200,00 $	46	4 985,00 $	4 486,50 $	5 732,75 $	Local labor
6,3	2100	finition	sq2	2,15 $	1 533,00 $	2 971,50 $	42	4 504,50 $	4 054,05 $	5 180,18 $	
7	1200	**Concrete slab**	sq2	-							
7,1	1200	Insulation	sq2	6,33 $	3 796,00 $	1 500,00 $	21	4 296,00 $	3 866,40 $	4 940,40 $	
7,2	1200	Concrete and finition	sq2	7,98 $	3 335,00 $	4 000,00 $	57	7 335,00 $	6 601,50 $	8 435,25 $	Mat price includes pump
8	155	**Interior walls**	sq								
8,1	155	Framing	sq	42,35 $	3 464,50 $	4 099,75 $	59	6 564,25 $	5 907,83 $	7 548,89 $	
8,2	10	Interior doors	unit	522,50 $	3 357,00 $	2 868,00 $	41	5 225,00 $	4 702,50 $	6 008,75 $	
8,3	3200	Drywall	sq2	2,37 $	1 888,00 $	5 680,00 $	81	7 568,00 $	6 811,20 $	8 703,20 $	
8,4	5000	Plastering	sq2	1,00 $	1 150,00 $	3 450,00 $	49	4 600,00 $	4 140,00 $	5 290,00 $	
8,5	5000	Painting	sq2	1,80 $	2 484,00 $	5 796,00 $	83	8 280,00 $	7 452,00 $	9 522,00 $	

Project: Accessible House
Project Nu : 028-19011
Prepared by : Jean Larouche
Type : New building
Location : Eastmain
Date: March 4th 2019
Revision 3

ID	Qty	Description	unit	PU	Material	Labor	Man-hours	Sub-total	Contingency Class B -10%	Contingency Class B 15%	Notes
9	1	**Plumbing**	gl								
9,1	1	Water input	gl	3 250,00 $	1 389,38 $	1 658,13 $	24	3 087,50 $	2 778,75 $	3 550,63 $	
9,2	1	Distribution	gl	13 868,37 $	5 928,73 $	7 246,22 $	104	13 174,95 $	11 857,46 $	15 151,19 $	
9,3	1	Accessories	gl	10 257,04 $	7 308,14 $	2 436,05 $	35	9 744,19 $	8 769,77 $	11 205,82 $	
10	1	**Electricity**									
10,1	1	Electric input	gl	4 650,00 $	2 871,38 $	1 546,13 $	22	4 417,50 $	3 975,75 $	5 080,13 $	
10,2	1	Distribution	gl	13 150,00 $	5 621,63 $	6 870,88 $	98	12 492,50 $	11 243,25 $	14 366,38 $	
10,3	1	Lighting/accessories/flatures	gl	2 500,00 $	1 781,25 $	583,75 $	8	2 375,00 $	2 137,50 $	2 731,25 $	
11	1	**Ventilation**									Bid for HVAC equipement
11,1	1	HVAC unit	gl	11 175,00 $	8 224,80 $	2 056,20 $	29	10 281,00 $	9 252,90 $	11 823,15 $	
11,2	1	Distribution	gl	8 257,04 $	3 798,24 $	3 798,24 $	54	7 596,48 $	6 836,83 $	8 735,95 $	
11,2	1	Grid and accessories	gl	2 450,00 $	1 127,00 $	1 127,00 $	16	2 254,00 $	2 028,60 $	2 592,10 $	
12	1	**Cabinet making**	gl	15 200,00 $	13 844,16 $	1 538,24 $	21,97 $	15 382,40 $	13 844,16 $	17 688,76 $	
13	1	**Electricity (Hydro-Quebec)**	gl	- $	- $	- $	- $	- $	- $	- $	
14	1	**Wood Stove**	gl	12 500,00 $	11 250,00 $	1 250,00 $	17,86 $	12 500,00 $	11 250,00 $	14 375,00 $	Bid for equipement
					Material from Rona :	56 787,23 $					
					Total :	153 391,80 $	123 358,75 $	1 762	276 742,55 $	249 068,29 $	318 253,93 $
			Building area	1190	sq2			Cost by sq2 :	$ 232,56	$ 209,30	$ 267,44

Assumptions
Materials costs by Rona from edmonton contractor estimate (transport to Eastmain included) for a total of 56 787.23$
Labor: 60% of the workers are locals (50$/h) and 40% of the workers are externals (100$/h including lodging, catering and transport)
1760MH: 10 weeks-4 workers-40h/sem
No project management included

Processed under the provisions of the Access to Information Act /Révisé en vertu de la Loi sur l'accès à l'information

Figure 12. Six-Plex

Ashini CONSULTANTS

Project: Six Plex
Project Nu : 028-19011
Prepared by : Jean Larouche
Type : New building
Location : Eastmain
Date : March 4th 2019
Revision 0

ID	Qty	Description	unit	PU	Material	Labor	Man-hours	Sub-total	Contingency Class B -10%	Contingency Class B 15%	Notes
1	6	Water input	gl	2 750,00 $	11 550,00 $	4 950,00 $	71	16 500,00 $	14 850,00 $	18 975,00 $	
2	1125	Excavation/ embankment	m3	31,50 $	24 806,25 $	10 631,25 $	152	35 437,50 $	31 893,75 $	40 753,13 $	Mat included excavation equipement
3	24	**Foundations**	m3		34 198,90 $	51 471,85 $	735	85 668,75 $	77 101,88 $	98 519,06 $	Concrete : 300$/m3, mat includes pump
3,1	18	Main footing	m3	1 325,00 $	- $	- $	-	- $	- $	- $	
3,2	6	Isolated footing	m3	1 050,00 $	- $	- $	-	- $	- $	- $	
3,3	1645	Isolated fundation walls	sq2	33,75 $	- $	- $	-	- $	- $	- $	
4	7345	**Building exterior walls**	sq2								
4,1	7345	Structure	sq2	7,25 $	39 736,45 $	13 514,80 $	193	53 251,25 $	47 926,13 $	61 238,94 $	
4,2	7345	Insulation	sq2	4,20 $	13 367,90 $	17 481,10 $	250	30 849,00 $	27 764,10 $	35 476,35 $	
4,3	6230	Outdoor siding (Canexel)	sq2	13,50 $	19 811,40 $	64 293,60 $	918	84 105,00 $	75 694,50 $	96 720,75 $	
4,4	1	Doors and windows (triple glasses)	gl	98 980,00 $	79 184,00 $	19 796,00 $	283	98 980,00 $	89 082,00 $	113 827,00 $	1 bid for windows
5	5890	**Main floor**	sq2								
5,1	5890	Structure	sq2	8,50 $	20 968,40 $	29 096,60 $	416	50 065,00 $	45 058,50 $	57 574,75 $	
5,2	5890	Flooring	sq2	7,50 $	19 878,75 $	24 296,25 $	347	44 175,00 $	39 757,50 $	50 801,25 $	Includes ceramic and vinyl (no price from rona for material)
6	4165	**Second floor**	sq2								
6,1	4165	Structure	sq2	7,00 $	14 827,40 $	14 327,60 $	205	29 155,00 $	26 239,50 $	33 528,25 $	
6,2	4165	Flooring	sq2	7,50 $	14 056,88 $	17 180,63 $	245	31 237,50 $	28 113,75 $	35 923,13 $	Includes ceramic and vinyl (no price from rona for material)
7	15757	**Roof**	sq2								
7,1	15757	Structure	sq2	12,75 $	67 597,53 $	133 304,22 $	1 904	200 901,75 $	180 811,58 $	231 037,01 $	Includes lifting equipment
7,2	6100	Insulation	sq2	4,50 $	17 995,00 $	9 455,00 $	135	27 450,00 $	24 705,00 $	31 567,50 $	
7,3	15757	Roofing	sq2	4,15 $	13 393,45 $	51 998,10 $	743	65 391,55 $	58 852,40 $	75 201,28 $	
7,4	15757	Finition	sq2	2,75 $	11 502,61 $	31 829,14 $	455	43 331,75 $	38 998,58 $	49 831,51 $	
8	5890	**Concrete slab**	sq2								
8,1	5890	Insulation	sq2	5,75 $	13 723,70 $	20 143,80 $	288	33 867,50 $	30 480,75 $	38 947,63 $	
8,2	5890	Concrete and finition	sq2	7,25 $	16 333,71 $	26 368,79 $	377	42 702,50 $	38 432,25 $	49 107,88 $	Mat price includes pump
9	2108	**Interior walls**	sq								
9,1	2108	Framing	sq	38,50 $	33 517,20 $	47 840,80 $	681	81 158,00 $	73 042,20 $	93 331,70 $	
9,2	6	Stairs	unit	4 250,00 $	9 753,75 $	15 746,25 $	225	25 500,00 $	22 950,00 $	29 325,00 $	
9,3	114	Interior doors	unit	475,00 $	26 869,80 $	27 280,20 $	390	54 150,00 $	48 735,00 $	62 272,50 $	
9,4	44047	Drywall	sq2	2,15 $	25 987,73 $	68 713,32 $	982	94 701,05 $	85 230,95 $	108 906,21 $	
9,5	39207	Plastering	sq2	1,00 $	9 017,61 $	30 189,39 $	431	39 207,00 $	35 286,30 $	45 083,05 $	
9,6	39207	Painting	sq2	1,80 $	19 478,04 $	51 094,56 $	730	70 572,60 $	63 515,34 $	81 153,49 $	

Ashini CONSULTANTS

Project: Six Plex
Project Nu : 028-19011
Prepared by : Jean Larouche
Type : New building
Location : Eastmain
Date : March 4th 2019
Revision 0

ID	Qty	Description	unit	PU	Material	Labor	Man-hours	Sub-total	Contingency Class B -10%	Contingency Class B 15%	Notes
10	6	**Plumbing**	gl								
10,1	6	Water input	gl	2 650,00 $	7 155,00 $	8 745,00 $	125	15 900,00 $	14 310,00 $	18 285,00 $	
10,2	6	Distribution	gl	11 750,00 $	31 725,00 $	38 775,00 $	554	70 500,00 $	63 450,00 $	81 075,00 $	
10,3	6	Accessories	gl	5 350,00 $	24 075,00 $	8 025,00 $	115	32 100,00 $	28 890,00 $	36 915,00 $	
11	6	**Electricity**									
11,1	6	Electric input	gl	4 150,00 $	16 185,00 $	8 715,00 $	125	24 900,00 $	22 410,00 $	28 635,00 $	
11,2	6	Distribution	gl	10 150,00 $	27 405,00 $	33 495,00 $	479	60 900,00 $	54 810,00 $	70 035,00 $	
11,3	6	Lighting/accessories/fixtures	gl	2 500,00 $	11 250,00 $	3 750,00 $	54	15 000,00 $	13 500,00 $	17 250,00 $	
12	6	**Ventilation**									Bid for HVAC equipement
12,1	6	HVAC unit	gl	11 175,00 $	53 640,00 $	13 410,00 $	192	67 050,00 $	60 345,00 $	77 107,50 $	
12,2	6	Distribution	gl	8 750,00 $	26 250,00 $	26 250,00 $	375	52 500,00 $	47 250,00 $	60 375,00 $	
12,3	6	Grid and accessories	gl	2 050,00 $	6 150,00 $	6 150,00 $	88	12 300,00 $	11 070,00 $	14 145,00 $	
13	6	**Cabinet making**	gl	11 200,00 $	60 480,00 $	6 720,00 $	98	67 200,00 $	60 480,00 $	77 280,00 $	
14	6	**Electricity (Hydro-Quebec)**	gl	- $	- $	- $	-	- $	- $	- $	
15	6	**Wood Stove**	gl	11 100,00 $	59 940,00 $	6 660,00 $	95	66 600,00 $	59 940,00 $	76 590,00 $	Bid for equipement
				Material from Rona :	355 001,77 $						
				Total :	**881 809,44 $**	**941 498,26 $**	**13 450**	**1 823 307,70 $**	**1 640 976,93 $**	**2 096 803,86 $**	
			Building area	**8185**	**sq2**			**Cost by sq2:**	**$ 222,76**	**$ 200,49**	**$ 256,18**

Assumptions
Materials costs by Rona from edmonton contractor estimate (transport to Eastmain included)
Labor: 60% of the workers are locals (50$/h) and 40% of the workers are externals (100$/h including lodging, catering and transport)
No project management included

Processed under the provisions of the Access to Information Act /Révisé en vertu de la Loi sur l'accés à l'information

Figure 13. Starter House

Project: **Home Ownership** Date : March 4th 2019
Project Nu : 028-19011 Revision 0
Prepared by : Jean Larouche
Type : New building
Location : Eastmain

ID	Qty	Description	unit	PU	Material	Labor	Man-hours	Sub-total	Contingency Class B -10%	15%	Notes
1	1	Water input	gl	2 750,00 $	1 925,00 $	825,00 $	12	2 750,00 $	2 475,00 $	3 162,50 $	
2	180,00	Excavation/ embankment	m3	31,50 $	3 969,00 $	1 701,00 $	24	5 670,00 $	5 103,00 $	6 520,50 $	Mat included excavation equipement
3	**14**	**Foundations**	**m3**		**19 948,19 $**	**34 501,81 $**	**493**	**54 450,00 $**	**49 005,00 $**	**62 617,50 $**	**Concrete : 300$/m3, mat includes pump**
3,1	12	Main footing	m3	1 325,00 $	- $	- $	-	- $	- $	- $	
3,2	2	Isolated footing	m3	1 050,00 $	- $	- $	-	- $	- $	- $	
3,3	1080	Isolated fundation walls	sq2	33,75 $	- $	- $	-	- $	- $	- $	
4	**1992**	**Building exterior walls**	**sq2**								
4,1	1992	Structure	sq2	8,75 $	10 776,72 $	6 653,28 $	95	17 430,00 $	15 687,00 $	20 044,50 $	
4,2	1992	Insulation	sq2	4,20 $	3 625,44 $	4 740,96 $	68	8 366,40 $	7 529,76 $	9 621,36 $	
4,3	2575	Outdoor siding (Canexel)	sq2	14,75 $	8 188,50 $	29 792,75 $	426	37 981,25 $	34 183,13 $	43 678,44 $	
4,4	1	Doors and windows (triple glasses)	gl	27 500,00 $	22 000,00 $	5 500,00 $	79	27 500,00 $	24 750,00 $	31 625,00 $	1 bid for windows
5	**1585**	**Main floor**	**sq2**								
5,1	1585	Structure	sq2	9,50 $	5 642,60 $	9 414,90 $	134	15 057,50 $	13 551,75 $	17 316,13 $	
5,2	1585	Flooring	sq2	7,50 $	5 349,38 $	6 538,13 $	93	11 887,50 $	10 698,75 $	13 670,63 $	Includes ceramic and vinyl (no price from rona for material)
6	**1900**	**Roof**	**sq2**								
6,1	1900	Structure	sq2	14,50 $	8 151,00 $	19 399,00 $	277	27 550,00 $	24 795,00 $	31 682,50 $	Includes lifting equipment
6,2	810	Insulation	sq2	4,50 $	2 389,50 $	1 255,50 $	18	3 645,00 $	3 280,50 $	4 191,75 $	
6,3	1900	Roofing	sq2	4,35 $	1 615,00 $	6 650,00 $	95	8 265,00 $	7 438,50 $	9 504,75 $	
6,4	1900	Finition	sq2	3,15 $	1 387,00 $	4 598,00 $	66	5 985,00 $	5 386,50 $	6 882,75 $	
7	**835**	**Concrete slab**	**sq2**								
7,1	835	Insulation	sq2	5,75 $	1 945,55 $	2 855,70 $	41	4 801,25 $	4 321,13 $	5 521,44 $	
7,2	835	Concrete and finition	sq2	7,25 $	2 315,56 $	3 738,19 $	53	6 053,75 $	5 448,38 $	6 961,81 $	Mat price includes pump
8	**2108**	**Interior walls**	**sq**								
8,1	155	Framing	sq	38,50 $	2 464,50 $	3 503,00 $	50	5 967,50 $	5 370,75 $	6 862,63 $	
8,2	15	Interior doors	unitée	475,00 $	3 535,50 $	3 589,50 $	51	7 125,00 $	6 412,50 $	8 193,75 $	
8,3	2825	Drywall	sq2	2,15 $	1 666,75 $	4 407,00 $	63	6 073,75 $	5 466,38 $	6 984,81 $	
8,4	2825	Plastering	sq2	1,00 $	649,75 $	2 175,25 $	31	2 825,00 $	2 542,50 $	3 248,75 $	
8,5	2825	Painting	sq2	1,80 $	1 403,46 $	3 681,54 $	53	5 085,00 $	4 576,50 $	5 847,75 $	
8,5	3250	Painting	sq2	1,80 $	1 614,60 $	4 235,40 $	61	5 850,00 $	5 265,00 $	6 727,50 $	

Project: **Home Ownership** Date : March 4th 2019
Project Nu : 028-19011 Revision 0
Prepared by : Jean Larouche
Type : New building
Location : Eastmain

ID	Qty	Description	unit	PU	Material	Labor	Man-hours	Sub-total	Contingency Class B -10%	15%	Notes
9	**1**	**Plumbing**	**gl**								
9,1	1	Water input	gl	2 650,00 $	1 192,50 $	1 457,50 $	21	2 650,00 $	2 385,00 $	3 047,50 $	
9,2	1	Distribution	gl	10 500,00 $	4 725,00 $	5 775,00 $	83	10 500,00 $	9 450,00 $	12 075,00 $	
9,3	1	Accessories	gl	3 250,00 $	2 437,50 $	812,50 $	12	3 250,00 $	2 925,00 $	3 737,50 $	
10	**1**	**Electricity**									
10,1	1	Electric input	gl	3 500,00 $	2 275,00 $	1 225,00 $	18	3 500,00 $	3 150,00 $	4 025,00 $	
10,2	1	Distribution	gl	12 750,00 $	5 737,50 $	7 012,50 $	100	12 750,00 $	11 475,00 $	14 662,50 $	
10,3	1	Lighting/accessories/fixtures	gl	3 150,00 $	2 362,50 $	787,50 $	11	3 150,00 $	2 835,00 $	3 622,50 $	
11	**1**	**Ventilation**									Bid for HVAC equipement
11,1	1	HVAC unit	gl	12 500,00 $	10 000,00 $	2 500,00 $	36	12 500,00 $	11 250,00 $	14 375,00 $	
11,2	1	Distribution	gl	12 000,00 $	6 000,00 $	6 000,00 $	86	12 000,00 $	10 800,00 $	13 800,00 $	
11,3	1	Grid and accessories	gl	2 050,00 $	1 025,00 $	1 025,00 $	15	2 050,00 $	1 845,00 $	2 357,50 $	
12	**1**	**Cabinet making**	**gl**	**10 500,00 $**	**9 450,00 $**	**1 050,00 $**	**15**	**10 500,00 $**	**9 450,00 $**	**12 075,00 $**	
13	**1**	**Electricity (Hydro-Quebec)**	**gl**	- $	- $	- $	-	- $	- $	- $	
14	**1**	**Wood Stove**	**gl**	**11 100,00 $**	**9 990,00 $**	**1 110,00 $**	**16**	**11 100,00 $**	**9 990,00 $**	**12 765,00 $**	**Bid for equipement**
				Materials from Rona :	73 651,81 $						
				Total :	**154 143,39 $**	**184 275,51 $**	**2 633**	**348 418,90 $**	**313 577,01 $**	**400 681,74 $**	
			Building area	**1090**	**sq2**		**Cost by sq2:**	$ 319,65	$ 287,69	$ 367,60	

Assumptions
Materials costs by Rona from edmonton contractor estimate (transport to Eastmain included)
Labor: 60% of the workers are locals (50$/h) and 40% of the workers are externals (100$/h including lodging, catering and transport)
No project management included

Processed under the provisions of the Access to Information Act /Révisé en vertu de la Loi sur l'accés à l'information

Figure 14. Elders' House

Ashini CONSULTANTS

Project: **Elder's house** Date : March 4th 2019
Project Nu : 028-19011 Revision 0
Prepared by : Jean Larouche
Type : New building
Location : Eastmain

ID	Qty	Description	unit	PU	Material	Labor	Man-hours	Sub-total	Contingency Class B -10%	Contingency Class B 15%	Notes
1	1	Water input	gl	2 750,00 $	1 925,00 $	825,00 $	12	2 750,00 $	2 475,00 $	3 162,50 $	
2	220,00	Excavation/ embankment	m3	31,50 $	4 851,00 $	2 079,00 $	30	6 930,00 $	6 237,00 $	7 969,50 $	Mat included excavation equipement
3	17	**Foundations**	m3		24 222,80 $	40 137,20 $	573	64 360,00 $	57 924,00 $	74 014,00 $	Concrete : 300$/m3, mat includes pump
3,1	14	Main footing	m3	1 325,00 $	- $	- $	-	- $	- $	- $	
3,2	3	Isolated footing	m3	1 050,00 $	- $	- $	-	- $	- $	- $	
3,3	1264	Isolated fundation walls	sq2	33,75 $	- $	- $	-	- $	- $	- $	
4	1741	**Building exterior walls**	sq2								
4,1	1468	Structure	sq2	7,25 $	7 941,88 $	2 701,12 $	39	10 643,00 $	9 578,70 $	12 239,45 $	
4,2	1468	Insulation	sq2	4,20 $	2 671,76 $	3 493,84 $	50	6 165,60 $	5 549,04 $	7 090,44 $	
4,3	1468	Outdoor siding (Canexel)	sq2	15,50 $	4 668,24 $	18 085,76 $	258	22 754,00 $	20 478,60 $	26 167,10 $	
4,4	1	Doors and windows (triple glasses)	gl	20 250,00 $	16 200,00 $	4 050,00 $	58	20 250,00 $	18 225,00 $	23 287,50 $	1 bid for windows
5	1462,5	**Main floor**	sq2								
5,1	1350	Structure	sq2	9,50 $	4 806,00 $	8 019,00 $	115	12 825,00 $	11 542,50 $	14 748,75 $	
5,2	1350	Flooring	sq2	7,50 $	4 556,25 $	5 568,75 $	80	10 125,00 $	9 112,50 $	11 643,75 $	Includes ceramic and vinyl (no price from rona for material)
6	1986	**Roof**	sq2								
6,1	1986	Structure	sq2	12,50 $	8 519,94 $	16 305,06 $	233	24 825,00 $	22 342,50 $	28 548,75 $	Includes lifting equipment
6,2	1520	Insulation	sq2	4,50 $	4 484,00 $	2 356,00 $	34	6 840,00 $	6 156,00 $	7 866,00 $	
6,3	1986	Roofing	sq2	4,15 $	1 688,10 $	6 553,80 $	94	8 241,90 $	7 417,71 $	9 478,19 $	
6,4	1986	Finition	sq2	2,75 $	1 449,78 $	4 011,72 $	57	5 461,50 $	4 915,35 $	6 280,73 $	
7	1462,5	**Concrete slab**	sq2								
7,1	1190	Insulation	sq2	5,75 $	2 772,70 $	4 069,80 $	58	6 842,50 $	6 158,25 $	7 868,88 $	
7,2	1190	Concrete and finition	sq2	7,25 $	3 300,02 $	5 327,48 $	76	8 627,50 $	7 764,75 $	9 921,63 $	Mat price includes pump
8	2108	**Interior walls**	sq								
8,1	110	Framing	sq	38,50 $	1 749,00 $	2 486,00 $	36	4 235,00 $	3 811,50 $	4 870,25 $	
8,2	12	Interior doors	unitée	475,00 $	2 828,40 $	2 871,60 $	41	5 700,00 $	5 130,00 $	6 555,00 $	
8,3	2350	Drywall	sq2	2,15 $	1 386,50 $	3 666,00 $	52	5 052,50 $	4 547,25 $	5 810,38 $	
8,4	2350	Plastering	sq2	1,00 $	540,50 $	1 809,50 $	26	2 350,00 $	2 115,00 $	2 702,50 $	
8,5	2350	Painting	sq2	1,80 $	1 167,48 $	3 052,52 $	44	4 230,00 $	3 807,00 $	4 864,50 $	

Ashini CONSULTANTS

Project: **Elder's house** Date : March 4th 2019
Project Nu : 028-19011 Revision 0
Prepared by : Jean Larouche
Type : New building
Location : Eastmain

ID	Qty	Description	unit	PU	Material	Labor	Man-hours	Sub-total	Contingency Class B -10%	Contingency Class B 15%	Notes
9	1	**Plumbing**	gl								
9,1	1	Water input	gl	2 650,00 $	1 192,50 $	1 457,50 $	21	2 650,00 $	2 385,00 $	3 047,50 $	
9,2	1	Distribution	gl	9 150,00 $	4 117,50 $	5 032,50 $	72	9 150,00 $	8 235,00 $	10 522,50 $	
9,3	1	Accessories	gl	3 250,00 $	2 437,50 $	812,50 $	12	3 250,00 $	2 925,00 $	3 737,50 $	
10	1	**Electricity**									
10,1	1	Electric input	gl	3 500,00 $	2 275,00 $	1 225,00 $	18	3 500,00 $	3 150,00 $	4 025,00 $	
10,2	1	Distribution	gl	9 150,00 $	4 117,50 $	5 032,50 $	72	9 150,00 $	8 235,00 $	10 522,50 $	
10,3	1	Lighting/accessories/fixtures	gl	3 150,00 $	2 362,50 $	787,50 $	11	3 150,00 $	2 835,00 $	3 622,50 $	
11	1	**Ventilation**									Bid for HVAC equipement
11,1	1	HVAC unit	gl	10 250,00 $	8 200,00 $	2 050,00 $	29	10 250,00 $	9 225,00 $	11 787,50 $	
11,2	1	Distribution	gl	9 000,00 $	4 500,00 $	4 500,00 $	64	9 000,00 $	8 100,00 $	10 350,00 $	
11,3	1	Grid and accessories	gl	2 050,00 $	1 025,00 $	1 025,00 $	15	2 050,00 $	1 845,00 $	2 357,50 $	
12	1	**Cabinet making**	gl	10 500,00 $	9 450,00 $	1 050,00 $	15	10 500,00 $	9 450,00 $	12 075,00 $	
13	1	**Electricity (Hydro-Quebec)**	gl	- $	- $	- $	-	$	- $	- $	
14	1	**Wood Stove**	gl	11 100,00 $	9 990,00 $	1 110,00 $	16	11 100,00 $	9 990,00 $	12 765,00 $	Bid for equipement
				Materials from Rona :	72 489,12 $						
				Total :	**151 396,85 $**	**161 581,65 $**	**2 308**	**312 958,50 $**	**281 662,65 $**	**359 902,28 $**	
				Building area	**1350 sq2**			**Cost by sq2:**	**$ 231,82**	**$ 208,64**	**$ 266,59**

Assumptions
Materials costs by Rona from edmonton contractor estimate (transport to Eastmain included)
Labor: 60% of the workers are locals (50$/h) and 40% of the workers are externals (100$/h including lodging, catering and transport)
No project management included

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Figure 15. Class D NZE Retrofit

Ashini CONSULTANTS

Project: House retrofit
Project Nu : 028-19011
Prepared by : Jean Larouche
Type : Existing building renovation
Location : Eastmain
Date : March 4th 2019
Revision 0

ID	Qty	Description	unit	PU	Material	Labor	Man-hours	Sub-total	Contingency Class B -10%	Contingency Class B 15%	Notes
1	0	Water input	gl	2 750,00 $	- $	- $	-	- $	- $	- $	
2	145,00	Excavation/ embankment	m3	31,50 $	3 197,25 $	1 370,25 $	20	4 567,50 $	4 110,75 $	5 252,63 $	Mat included excavation equipement
3	0	**Foundations**	m3		- $	17 064,00 $	244	17 064,00 $	15 357,60 $	19 623,60 $	Concrete : 300$/m3, mat includes pump
3,1	0	Main footing	m3	1 325,00 $	- $	- $	-	- $	- $	- $	
3,2	0	Isolated footing	m3	1 050,00 $	- $	- $	-	- $	- $	- $	
3,3	1264	Isolated fundation walls	sq2	13,50 $	- $	- $	-	- $	- $	- $	
4	2362,5	**Building exterior walls**	sq2								
4,1	2362,5	Structure	sq2	10,75 $	12 781,13 $	12 615,75 $	180	25 396,88 $	22 857,19 $	29 206,41 $	
4,2	2362,5	Insulation	sq2	4,20 $	4 299,75 $	5 622,75 $	80	9 922,50 $	8 930,25 $	11 410,88 $	
4,3	2362,5	Outdoor siding (Canexel)	sq2	15,50 $	7 512,75 $	29 106,00 $	416	36 618,75 $	32 956,88 $	42 111,56 $	
4,4	1	Doors and windows (triple glasses)	gl	26 250,00 $	21 000,00 $	5 250,00 $	75	26 250,00 $	23 625,00 $	30 187,50 $	1 bid for windows
5	1700	**Roof**	sq2								
5,1	1700	Structure	sq2	12,50 $	7 293,00 $	13 957,00 $	199	21 250,00 $	19 125,00 $	24 437,50 $	Includes lifting equipment
5,2	1485	Insulation	sq2	6,75 $	4 380,75 $	5 643,00 $	81	10 023,75 $	9 021,38 $	11 527,31 $	
5,3	1700	Roofing	sq2	4,15 $	1 445,00 $	5 610,00 $	80	7 055,00 $	6 349,50 $	8 113,25 $	
5,4	1700	Finition	sq2	2,75 $	1 241,00 $	3 434,00 $	49	4 675,00 $	4 207,50 $	5 376,25 $	
6	1462,5	**Concrete slab**	sq2								
6,1	1134	Insulation	sq2	5,75 $	2 642,22 $	3 878,28 $	55	6 520,50 $	5 868,45 $	7 498,58 $	
6,2	1134	Concrete and finition	sq2	7,25 $	3 144,72 $	5 076,78 $	73	8 221,50 $	7 399,35 $	9 454,73 $	Mat price includes pump
				Material from Rona :	44 740,32 $						
				Total :	**68 937,57 $**	**108 627,81 $**	**1 552**	**177 565,38 $**	**159 808,84 $**	**204 200,18 $**	
			Building area	**1134**	**sq2**			**Cost by sq2:**	$ 156,58	$ 140,92	$ 180,07

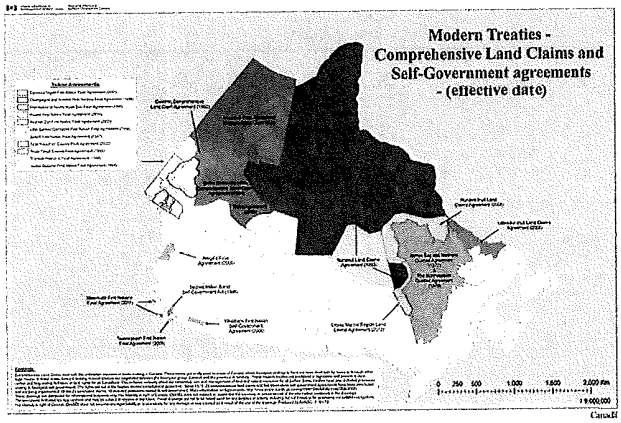
Assumptions
Materials costs by Rona from edmonton contractor estimate (transport to Eastmain included)
Labor: 60% of the workers are locals (50$/h) and 40% of the workers are externals (100$/h including lodging, catering and transport)
No project management included

CHAPTER 9: IMPLEMENTATION PHASE

Duty to Consult with Indigenous groups

The CNE is an Indigenous group, having recognized and constitutionally-protected land rights in Eeyou Istchee, the territory where it will carry out its Net-Zero Housing Program. As such, the CNE is not subject to the duty to consult.

Figure 16. Treaties Map



Modern Treaty Obligations

The CNE is one of the signatories to the *James Bay and Northern Quebec Agreement*, Canada's first modern-day treaty. The CNE therefore does not have any obligations, in the context of its NZE program, under federal or provincial legislation with respect to Indigenous treaty rights.

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Community Employment Benefit (CEB)

If selected as the $5M category winner of the Smart Cities Challenge, the CNE will report on the *Community Employment Benefit* for Indigenous people. Its NZE program is inclusive in that it offers employment and business opportunities to youth, women and apprentices for skilled trades. Tendering for work that will be carried out under the NZE program will prioritise small, local Indigenous business and tradespeople.

Already the CNE has hired 3 youth under a work placement program to gain experience with the project management team and McGill University. The CNE will engage other youth as part of the trades training initiative under the NZE program. We will also target employment for youth with disabilities.

Part of our project management team includes an Indigenous-owned and operated engineering firm. The CNE will support Indigenous businesses as part of our procurement process.

Climate Lens Assessment (CLA)

Climate Lens Assessment is not applicable to CNE's project due to it being within the $5M category.

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ENERGY POVERTY REDUCTION PROGRAM

Final Application to the Smart Cities Challenge $5M Prize Category

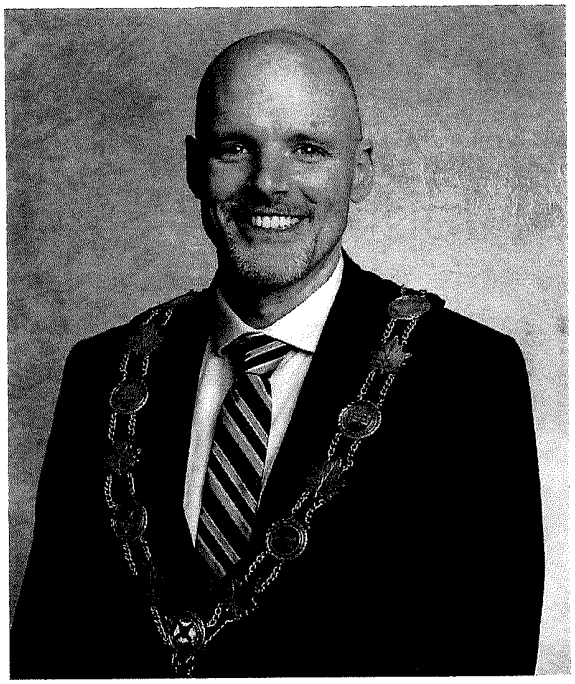
SMART CITIES CHALLENGE

ENERGIZE BRIDGEWATER

town of BRIDGEWATER

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MESSAGE FROM THE MAYOR



Mayor David Mitchell

Our community will lift its residents out of energy poverty, starting by reducing the energy poverty rate by 20% by 2025.

As Mayor of the Town of Bridgewater, that is a challenge statement that makes me proud to serve my community. The fact is, Bridgewater is ready for a massive shift toward a smart energy economy by becoming a Smart Community. Through our Energize Bridgewater program, our community has demonstrated nationally-recognized leadership in understanding and planning a pathway toward a new kind of energy economy – one where energy services are universally available and affordable, clean and efficient, and protected from supply volatility and the coming ravages of climate change.

Through our proposed solutions, we will make sure that those among us who are most vulnerable, and least able to afford the transition, are the first ones we help across the threshold. Those residents have the most to lose, and through the betterment of their lives, our community has everything to gain.

The stories shared by our community partners and residents have made it clear that energy poverty is having a profound and debilitating impact here in Bridgewater. It systematically strips as many as 40% of our residents of their dignity and damages the physical and mental wellbeing of young and old alike.

Yet, the real, lasting, and practical solutions to this problem are so close at hand that we can already see them emerging. Through this Challenge, our town will design and prototype a new model of municipally-led accessible and affordable energy management services for our community's most vulnerable residents. Dramatic improvements to housing, transportation, and community services will be driven by a self-financing investment program and a coordinated access system, all powered by connected technologies.

We've been innovative. We've been bold. We've made change happen. However, nothing we've done to date has come close to achieving the impact of our proposed Energy Poverty Reduction Program. At the same time, everything we've done to date has prepared us to make this leap.

We need help in launching this bold idea. By selecting Bridgewater as the winner in the $5 million Smart Cities Challenge prize category, Canada will support a powerful new demonstration of technology-enabled community-based problem solving that addresses both the poverty crisis and the climate crisis at the same time. Bridgewater is ready to show Atlantic Canada, and the nation, how it can be done.

David Mitchell
Mayor, Town of Bridgewater

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EXECUTIVE SUMMARY

Our community will lift its residents out of energy poverty, starting by reducing the energy poverty rate by 20% by 2025.

Bridgewater's growing need for clean and reliable energy is limited by our ability to afford it. Our estimates show that the burden of energy poverty is carried by 38% of Bridgewater households that are unable to meet their basic energy and transportation needs. Many more are at risk of falling into this category as it's expected that energy prices will continue to trend upwards. Bridgewater is approaching this issue through systematic change at a household, neighbourhood, community, and regional level by, treating access to affordable and secure energy as a requirement for healthy living. To ensure residents can live free of the constant threat of energy poverty, our program uses energy management as a smart city approach for resident empowerment.

Bridgewater envisions an Energy Poverty Reduction Program that uses data and connected technology to bring together and drive energy savings to create financial returns for households and property owners. This system also provides coordinated access to community supports for households experiencing energy poverty. And finally, a financial system that supports extensive investment in energy efficiency solutions. Bridgewater's impactful, comprehensive approach to community-based problem solving and transformational change is highly transferrable to communities across the country that are struggling with energy poverty challenges of their own. Municipalities are uniquely positioned to be at the forefront the of shifting world of energy systems, pairing data and connected technologies for community services that ensure underserved populations are the first beneficiaries of the energy transition.

1. **Vision:** why this matters, and overview of services
2. **Performance Measurement:** detailed program descriptions, deliverables, and outcomes
3. **Governance:** accountability structure, and program partners
4. **Project Management:** team members and risk management
5. **Technology:** data platforms, connected technologies, and energy solutions
6. **Data and Privacy:** how information will be used, safeguarded, and shared
7. **Engagement:** community consultations up to now, and going forward
8. **Implementation Phase Requirements:** fulfilling national expectations
9. **Financial:** costs, revenues, innovative financing solutions, and how we used the Finalist Grant

Appendix: letters of support

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TOWARD A FUTURE FREE OF ENERGY POVERTY

Bridgewater, like most communities across Canada, has a growing hunger for energy. Our energy needs are everywhere – cellular phones, warm showers, food refrigeration, heat during the frigid winters, lights, laundry, and computers. With our energy needs increasing, many households in Bridgewater are unable to afford the rising costs of this service and are having to make impossible decisions to balance monthly household budgets.

As a 'have not' province, Nova Scotia has struggled for decades with the issue of widespread poverty and low incomes. Given our region's and our community's overall economic challenges, energy insecurity adds a real and growing threat to our ability to meet our basic needs. When we asked our community partners to tell us how urgent energy poverty issues are in relation to other issues in Bridgewater, Family Service of Western Nova Scotia stated: "this may be the least talked about yet most significant and productive structural, community, and individual issue we could tackle." The challenge of energy poverty is daunting and overwhelming, yet the Town of Bridgewater is firmly convinced that it is possible to create a solution to both the poverty crisis and the climate crisis by using technology-enabled community-based problem solving.

Energy poverty isn't just lingo for Bridgewater – it is a real problem for real people. Our program team has spent considerable effort in defining this term to be meaningful to our residents, especially those who identify with its hardships. In our initial application, we **defined energy poverty using the indicator of a household spending 10% or more of its after-tax income on energy, with fuels and electricity for the home as well as transportation counting toward energy expenditures.** We maintain that this definition is accurate, but understand that energy poverty can also be so much more.

Bridgewater and its community further defines **energy poverty based on access to affordable and secure energy in their home, neighbourhood, community, and region. The greater the degree of insecurity or lack of access, the greater the risk that the household will experience energy poverty**[1] This shift in perspective lifts the burden of energy poverty mitigation from being focused solely on the individual household, toward including community and regional infrastructure and services.

With this new emphasis on risk for energy poverty, research was required to determine what exactly the risk factors are and how this affects Bridgewater's vulnerability. Table 1.1 describes the energy poverty risk factors identified by our community.

Systematic Levels of Energy Poverty Risk

Risk Level	Description
1. Household	Household-level risk factors include personal risk influences such as the energy efficiency of the home and transportation means as well as general poverty risk factors such as income, health, literacy, family supports, etc.
2. Neighbourhood	Neighbourhood-level risk factors include neighbourhood energy systems, walkable streets, transit service, etc., as well as the energy efficiency of multi-unit residential buildings (MURBs).
3. Community	Community-level risk factors include community-scale energy and transportation systems, the energy efficiency of the overall housing stock, community support services, social stigma, and whether the community has developed a coordinated response to the problem of energy poverty.
4. Broader Systems	Broader systems-level risk factors include the price of energy in the region; the availability of secure, affordable energy technologies; employment opportunities; economic diversity, etc. It also includes provincial and federal programs and policies that may remedy or exacerbate energy poverty.

Table 1.1

[1] This model of energy poverty aligns well with the Social Determinants of Health and other health risk and inequality models used by modern public health initiatives including Health Canada.

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As Bridgewater gained a greater understanding of energy poverty during the final application phase, the breadth of its impact on our community became startlingly clear. Early research indicated that as much as 40% of Bridgewater's population may be experiencing energy poverty in some form. A community census was undertaken to validate residents' lived experience with energy poverty. From that census, we can confirm that 38% of residents currently experience, or are highly at risk of, energy poverty. Add to that the recent Statistics Canada report that the number of Nova Scotian children in poverty has risen from 14% in 2016 to 17% in 2017[2] and it is very clear that the problem of poverty in our community is not going away and requires urgent and responsive action.

Bridgewater is a community driven to overcome our challenges through deep engagement and innovative projects. To demonstrate our sincerity in creating real and meaningful change, Bridgewater commits itself to the following Challenge Statement:

Our community will lift its residents out of energy poverty, starting by reducing the energy poverty rate by 20% by 2025.

Targeted Energy Poverty Reduction Rate by Program Year

Year	2020-21	2021-22	2022-23	2023-24	2024-25	2029-30 After 5 more years
Population *(projected)*	9,031	9,156	9,211	9,266	9,320	9,583
Households Experiencing Energy Poverty *(projected, based on current 38.5% energy poverty rate)*	1,659	1,682	1,692	1,702	1,712	1,760
Number of Households Helped *(Cumulative)*	0	50	125	225	350	1,100
Energy Poverty Rate Reduction *(Cumulative)*	0%	3%	7%	13%	20%	62%

Table 1.2

With a five-year implementation horizon for the Smart Cities Challenge, the community has designed a program that will reduce the energy poverty rate in Bridgewater by 20% by 2025, while maintaining the long-term goal from the original challenge statement to lift 20% of its residents out of energy poverty within 10 years. With a $5 million grant from Smart Cities Challenge, the Town is confident that change can be realized within a single generation. And with a revised start date of 2020, the Town is eager to begin this very important work.

Based on the current and projected future population of the community, our Challenge would mean lifting 350 households out of energy poverty by fiscal year 2024-25. The community would then be on track to cut its overall energy poverty rate in half by 2028, and by as much as 62% over a 10-year timeframe (by fiscal year 2029-30). Our anticipated progress is illustrated in Table 1.2.

The Town of Bridgewater envisions a future for our community where energy poverty reduction strategies work in tandem with clean and efficient energy systems to confront energy poverty at its core – the very source of the energy itself. With assistance from the Smart Cities Challenge, we will overcome existing barriers to achieve our community vision:

[2] Statistics Canada, accessed on February 28, 2019 https://www150.statcan.gc.ca/t1/tbl1/en/cv.action?pid=1110013501

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By 2050, Bridgewater's green, self-supportive economy will be securely powered by clean and efficient energy systems. The community's conscious investments into energy infrastructure, equipment, training, and education will make energy affordable and accessible for all members of the community, and contribute to our town's prosperity and resilience in the face of a changing climate and world.

- Bridgewater's Energy Shift vision, Community Energy Investment Plan (2018)

Our commitment to this project will empower our community to take a leadership role in combating energy poverty, which is a daily threat to our sustained health and economic viability. The energy poverty solution is our most ambitious vision to date and we can't wait to show the rest of Canada that even small towns like Bridgewater can lead a change of this magnitude.

ENERGY MANAGEMENT AS A SMART CITY APPROACH

Households experiencing energy poverty know first-hand the critical importance of managing their energy consumption and therefore their expenses. The stories we have collected from the community have been truly stunning in this regard: we have documented families turning off their heat for days at a time in the middle of winter to be able to afford their next power bill, or going without light and powered devices at the expense of their health and wellbeing. From an energy management perspective, this has informed us that Bridgewater residents who experience energy poverty often already have well-practiced skills in energy management. What they tend to lack is energy efficient home heating systems and other infrastructure to work with, and adequate control over their home and transportation options.

I reduced my power bill from $120 to $60 by unplugging everything when I am not using it. I don't really use lights, only when company is over. I use my phone as a flashlight. – RESIDENT, TOWN OF BRIDGEWATER

Bridgewater's Energy Poverty Reduction Program is well matched to a smart cities approach, as it aims to restore control to our residents over their energy costs and infrastructure by leveraging the fundamental benefits that data and connected technology have to offer. Throughout this application we will reinforce how a small town can be a smart city by showcasing:

- how data can be used to create open and strong communities inclusive of the most vulnerable members and how access barriers to this data can be overcome (**See Data and Privacy chapter**);
- how data and connected technology can be a uniting force to bring together the municipality, other levels of government, government organizations, and private enterprise (See **Technology chapter**);
- how the innovation of one community can be transferable to our neighbours across the nation (see **Performance Measurement** and **Project Management chapters**);
- how connected technology enables collaboration between service providers and industry for the betterment of society (See **Governance chapter** and **Data and Privacy chapter**).

Through the program, the Town of Bridgewater will provide advanced new **energy management support services** to 2 primary clients:

1. Bridgewater households who are highly at risk of energy poverty, currently estimated at 38% of Bridgewater's population.
2. Bridgewater property owners whose properties are inhabited by households-at-risk of energy poverty. Housing energy efficiency is a key risk factor in determining whether or not a household will experience energy poverty. Groups of property owners can be clustered together to receive neighbourhood-scale energy services and solutions.

In situations where the households-at-risk own the homes they live in, the two clients are one and the

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same. For a large number of households-at-risk, however, home ownership is not affordable, and rental housing is their only option. In this case, the property owner is the household's landlord. In Bridgewater, 43% of residents rent their home (Statistics Canada, 2016). We anticipate that the majority of property owners in the programwill be landlords.

As we explain in the rest of this application, the Energy Poverty Reduction Program builds on existing municipal service competencies, data systems, and infrastructure. As such, this service concept is widely replicable and transferrable to other communities where municipalities already play a critical role in community service provision.

For those experiencing energy poverty, access to the technology and data to manage their energy needs is often very limited. For the most vulnerable, interfacing with a human rather than a dashboard is the most practical way to assist with assessing their needs and solving the immediate problems caused by energy poverty. Not having or being at risk of losing their shelter, these residents will need access to a range of community, health, employment, and other services, not just services that relate to housing and transportation.

The program will establish navigators for the different system components of the Energy Poverty Reduction Program. These navigators will be human interfaces for households-at-risk, connecting them with the services they need, including the energy management services offered by the Town of Bridgewater. Coordinated Access Systems are widely replicable and transferrable to other communities. Additional information is provided in the following chapters.

INNOVATION AT THE CORE

The design of the Energy Poverty Reduction Program combines 3 innovative mechanisms to reduce risk of energy poverty:

1. Connected technologies: forming the backbone of the service concept, connected technologies provide a technological 'engine' that drives energy savings to create financial returns for the households and property owners, and streamlines client intake and access to community services.
2. Coordinated access: a social support 'engine' that keeps clients connected to the program and coordinates access to the various additional community supports households-at-risk may need.
3. Financial investment: building on Bridgewater's experience developing a fully-costed approach to energy transition, self-financing energy improvements provide a financial 'engine' that supports extensive investment in energy efficiency solutions.



Community Working Group members view a presentation at a Smart Cities Challenge workshop.

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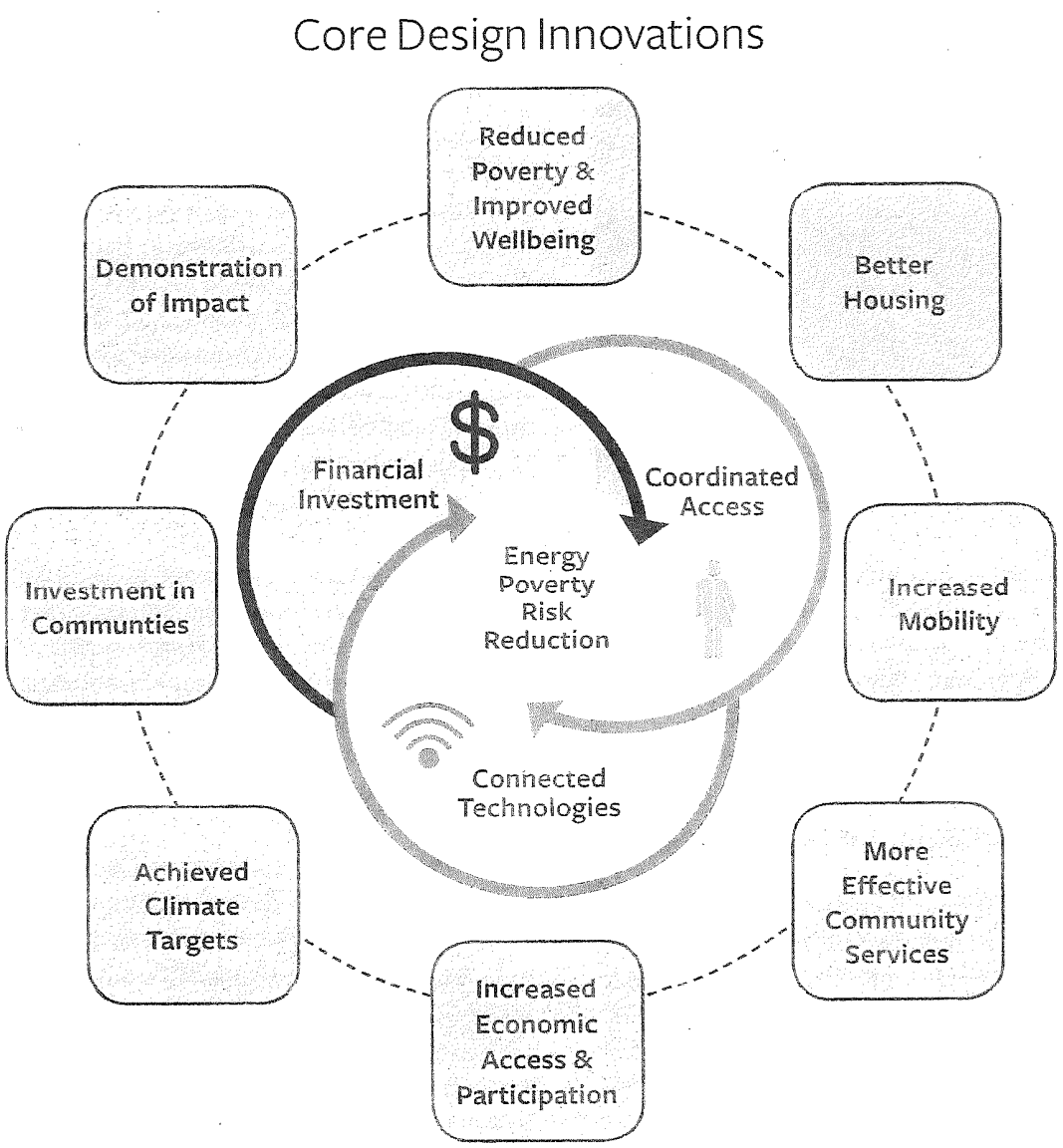


Diagram 1.1

These 3 innovations mutually enable and strengthen each other's outcomes. This synergy drives systematic and continuous improvements to housing, transportation, and community services, thereby reducing energy poverty risk and improving many dimensions of community life. These innovations and their anticipated outcomes are captured visually in Diagram 1.1.

A GREATER COMMUNITY IMPACT

Starting with our initial application, we have embarked on a deep and meaningful discussion with our community. From households-at-risk, to community service organizations, to landlords and energy utilities, the Town has listened to lived experiences in our community and developed a program that will positively impact a multitude of community needs. Consequently, our program outcomes have grown substantially. Table 1.3 summarizes the anticipated outcomes by category, and indicates their relationship to our initial application:

The expanded outcomes demonstrate a greater understanding and articulation of our Challenge to lift our residents out of energy poverty. Cumulatively, they reflect the community's urgent call for transformative change at all levels to achieve this goal. The outcomes are transferrable to other communities with very different local and regional contexts compared

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Anticipated Outcomes by Category

Outcome Category	Outcomes	Relation to Initial Application (April 2018)
Reduced Poverty & Improved Wellbeing	1. Reduce energy poverty rate	Challenge statement
	2. Reduce poverty	New
	3. Improve health of residents	Outcome 6
	4. Increase residents' quality of life	New
	5. Increase residents' sense of empowerment and inclusion	New
Better Housing	6. Increase energy security for residents	New
	7. Reduce and stabilize energy expenses for residents	Outcome 4
	8. Improve relationship between tenants and landlords	New
	9. Improve residential energy management practices	New
Increased Mobility	10. Improve residents' mobility	Outcome 3
More Effective Community Services	11. Improve residents' access to community services	New
	12. Improve community service delivery efficiency and effectiveness	Outcome 7
	13. Shift community service spending toward systemic solutions	Outcome 8
Increased Economic Access & Participation	14. Increase residents' income	Outcome 8
	15. Increase residents' participation in the green economy	Outcome 8
Achieved Climate Targets	16. Reduce greenhouse gas emissions	New
	17. Shift to efficient, clean, affordable, and secure energy	New
Investment in Communities	18. De-risk affordable energy investments in the community	New
	19. Successfully fund energy poverty reduction solution	New
Demonstration of Impact	20. Demonstrate feasibility and effectiveness of program	New
	21. Inspire structural energy poverty solutions at the Provincial and Federal levels	New
	22. Inspire other communities to adopt energy poverty reduction efforts	New

NOTE: No outcomes have been lost between the initial and final applications. Outcome indicators and targets are described in detail in the **Performance Measurement chapter.**

Table 1.3

to Bridgewater. While other communities may need to make modifications to the specific indicators used to measure progress based on locally available information, the outcomes are universally meaningful, measurable, monitorable and well-suited to a smart cities approach.

APPLICATION REFINEMENTS TO BETTER ACHIEVE OUTCOMES

In order to lift our residents out of energy poverty, the design of the Energy Poverty Reduction Program has undergone significant improvement and refinement. Whereas it was originally proposed as a set of 7 interlocking sub-programs, the updated program design has been simplified into a set of 5 connected services, designed with universal transferability and application to other communities in mind.

Program services are explained in the sections that follow:

Coordinated Access System

This service provides a single coordinated intake process for program participants, with a special focus on households-at-risk who may be in need of acute and emergency services, underserved subpopulations, as well as those who can benefit from preventative services. A common assessment tool (VI-SPDAT[3] or similar) aids the intake and referral process, and encourages

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uniformity within and between communities. Using a trauma-informed service provision lens and specialized training, multiple system access points and outreach services refer new and existing clients to any community services they may require, including: protective; health; social; housing and emergency shelter; transportation; financial; employment; education and training; accessibility; and other related community and government services. Among these services are the services provided by the Energy Poverty Reduction Program.

Energy Poverty Reduction Program Architecture

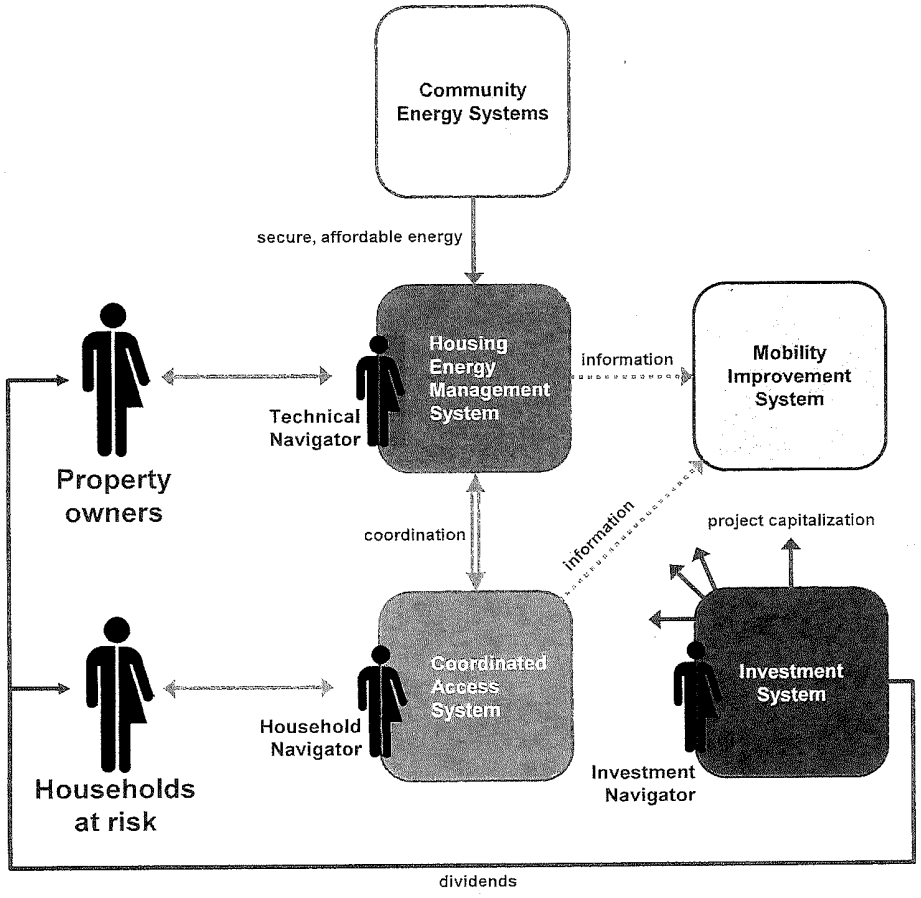


Diagram 1.2

The service consists of 2 sub-programs that are explained in detail in the **Performance Measurement chapter: Partnership Coordination, and Coordinated Access Service Provision.**

Communities that already have a Coordinated Access System in place can leverage those existing services.

Relationship to Data & Connected Technologies: we propose that this service make use of the nationally-accessible Homeless Individuals and Families Information System (HIFIS), hosted by Employment and Social Development Canada (ESDC), as its core data platform. This will facilitate data exchange with community service providers as well as the municipal data platform that will house the rest of the Energy Poverty Reduction Program. The use of this national database would also facilitate inter-community collaborations and performance metric comparisons.

[3] Developed by Org Code Consulting, this assessment tool is widely used in Canada for planning and prioritizing service provision to underserved populations particularly for housing and shelter needs. The tool is already in use in Bridgewater.

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Housing Energy Management System

This service provides property owners with turn-key energy monitoring, planning, management, retrofit, and financing services. Services address retrofits to existing housing stock, as well as services and incentives to support the construction of highly efficient new housing units. The target of the program is to achieve a universal energy performance improvement of the community's housing stock of approximately 60%, and to further supplement that with an additional 30% in renewable energy generation, for a total imported energy cost reduction of 90%. Individual energy performance targets will be set for participating properties as part of the client intake process, and will be updated periodically as new energy management solutions become available.

The service consists of 3 sub-programs that are explained in detail in the Performance Measurement chapter: **Program Coordination & Administration, and Housing Retrofits and New Construction.**

The service is designed to leverage existing municipal competencies in asset management and service provision. It also enables communities to leverage and stack existing and emerging energy efficiency programs, whether those have been implemented on the municipal, provincial, or federal levels. In Bridgewater's case, the programming offered through this service will build heavily on, and significantly expand, Efficiency Nova Scotia's energy efficiency services and financial incentives aimed at improving the province's housing stock.

Relationship to Data & Connected Technologies: existing municipal property and financial management software will be used as the core data platform for this program, with the addition of an Energy Management Information System (EMIS) module, and an expansion into Real Time Operations (RTO) functionality. The EMIS interfaces with a network of connected technology points to provide the core energy management functions of energy monitoring, forecasting, and control. The system's functionality is expanded gradually over time as new energy management solutions and community energy systems come online. In Bridgewater's case, the proposed data platform is TownSuite, the Town's current municipal management software.

Community Energy Systems

Supplementing energy improvements in individual homes, this service plans and develops neighbourhood and community-scale energy systems such as solar farms, district heating systems, and microgrids. These systems feed secure and affordable energy to participating properties, and earn dividends for their investors. The service consists of 2 sub-programs that are explained in detail in the **Performance Measurement chapter: Utility Grade Service Provision, and Neighbourhood & Community Scale Energy Systems.**

Communities with their own energy utilities can leverage those existing services to deliver these functions. As community-scale energy solutions will differ based on local and regional context, specific applications need to be tailored to the needs of individual communities. In Bridgewater's case, the community is in the process of exploring the development of its own energy utility, as well as the potential procurement of utility-grade services from an existing utility in the area. Feasibility studies for the selection and implementation of community-scale energy systems are included in the first few years of the program, with a 6MW "solar garden" as the preliminary choice for community-scale energy technology in this proposal.

Relationship to Data & Connected Technologies: community-scale energy systems are powered and controlled by connected digital systems, allowing for a new generation of advanced net-metering, microgrid, and local energy market applications. These functions can effectively integrate into the

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municipal property and financial management software described above.

Mobility Improvement System

This service receives information from the Coordinated Access System and the Housing Energy Management System to plan and implement mobility improvements based on community needs. As municipalities are typically responsible for neighbourhood and community-scale transportation systems, this service will typically integrate with and expand on existing municipal services.

The service consists of 2 sub-programs that are explained in detail in the **Performance Measurement** chapter: **Program Coordination & Administration, Transit System Improvements,** and **Active Transportation Improvements.**

Communities with their own road, trail, and public transit infrastructure would tailor this service to their own infrastructure and services, which may also include regional transportation planning. In Bridgewater's case, intra and inter-community public transit services and active transportation infrastructure improvements are the primary areas of focus, though paratransit and ride sharing services may eventually form part of the service planning model as well.

Relationship to Data & Connected Technologies: mobility improvement planning efforts are enhanced by the use of data from the Housing Energy Management System and the Coordinated Access System through the use of spatial data and transportation network routing and planning, as well as mobility indicators and feedback from clients. These functions can effectively integrate into the municipal property and financial management platform.

Investment System

This service funnels funds from investors into the services described above. Program investors are categorized into (1) social value investors, which include governments and charitable organizations, and (2) financial investors seeking a return on investments from housing and community energy systems. Using creative financing tools, property owners and households-at-risk can also become investors in the system and receive dividends.

The service consists of 2 sub-programs that are explained in detail in the **Performance Measurement** chapter, and expanded on in the **Financial chapter: Municipal Capitalization System, and Financial Investment Vehicle.**

This service builds on existing municipal competencies related to budgeting and asset management. Communities that work closely with external fundraising entities can leverage those relationships to build this system, and those municipalities that are permitted by legislation to use innovative capitalization strategies (e.g. community bonds or green bonds) may make use of those capitalization opportunities as well. In Bridgewater there is no existing Financial Investment Vehicle to leverage, so the implementation of this service includes a period of feasibility assessment and organizational development. Emerging energy financing services, including Energy Services Companies (ESCOs) are anticipated to play a significant role in the capitalization of these improvements both in Bridgewater and across the country.

> We can't judge people like 'How did you forget your child's mittens today?' when there may be water coming in their window, the landlord may not be available; they may be cold, they may be hungry.
>
> – COMMUNITY SERVICE ORGAIZATION

Relationship to Data & Connected Technologies: financial planning efforts and investment opportunities are calculated and driven by the robust EMIS system that forms the core function of the program's data system. Financial planning and management for the

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program can effectively integrate into the municipal property and financial management software described above. External financial investment systems will rely on external data platforms. In Bridgewater's case the external platform still needs to be determined, though for planning and budgeting purposes, the MaRS Centre for Social Innovation's SVX platform is used as the placeholder system for this service.

The relationship between these revised programs and those described in the initial application are summarized in Table 1.4.

The restructuring of the Energy Poverty Reduction Program has significantly improved its implementation potential, as well as improved transferability, scalability, and replicability to other communities.

Original and Revised Program Components

Program Components As Originally Proposed (April 2018)		Revised Program Components
Theme 1: housing and transportation investments	Program A: local clean energy investment system	Investment System
	Program B: comprehensive retrofit improvement program for low-income homes and rental properties	Housing Energy Management System
	Program C: regulations and incentives for the construction of new high-energy-performing affordable rental units	Housing Energy Management System
	Program D: public transit and active transportation service and infrastructure improvements	Mobility Improvement System
Theme 2: resident engagement and capacity building	Program E: engagement program for residents*	Coordinated Access System and Housing Energy Management System
	Program F: clean tech sector trades training program for residents	N/A
Theme 3: partner collaboration and capacity building	Program G: data sharing and collaboration program for partner organizations	Coordinated Access System

Table 1.4 *Program F, the clean tech sector trades training program for residents, was found to be impractical at this time, as local trades training organizations were unable to commit to trades training outcomes and timelines. Instead, the Nova Scotia Community College has provided a letter (see **Appendix**) indicating its ongoing support for the Energy Poverty Reduction Program, and its willingness to explore integration with its Work Integrated Learning courses, the Women Unlimited program, and participating in the Coordinated Access System in order to provide information, where applicable, around training opportunities. The College continues its interest in the creation of new programming options in the areas around Green Energy and Technologies, but this will require additional study and development before the College is able to confirm its offerings.

INNOVATIONS SUITABLE FOR NATIONAL DEMONSTRATION

This high-impact, comprehensive approach to community-based problem solving and transformational change is highly transferrable to communities across the country that are struggling with energy poverty challenges. As the world shifts its energy systems, these transitions will be inherently challenging as economic disruption occurs and less affluent Canadians are saddled with the remnants of outdated or legacy energy systems, whether those are housing technologies or energy systems from the last century. Municipalities are uniquely positioned to take advantage of emerging energy systems, pairing them with data and connected technologies, and delivering robust and accountable services that improve affordability and quality of life for historically underserved populations. In this way, municipalities can play a critical new role in facilitating a transformation for our communities, especially their most vulnerable members, through the coming energy shift.

By selecting Bridgewater as the winner in the $5 million Smart Cities Challenge prize category, Canada will support a powerful new demonstration of technology-enabled community-based problem solving to its stated objectives of addressing both the poverty crisis and the climate crisis at the same time.

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PERFORMANCE MEASUREMENT OVERVIEW

To support the ambitious scope and complexity of Bridgewater's Energy Poverty Reduction Program, we have developed a methodical implementation and performance measurement schedule. The following section outlines the activities and outputs, including deployment schedule and anticipated deliverables for each of the 5 systems that form the overall Energy Poverty Reduction Program: Coordinated Access; Housing Energy Management; Community Energy; Mobility Improvement; and, Investment.

An evaluation framework is proposed and detailed in Table 2.9. A logic model consisting of activities, outputs, and outcomes has been developed to guide the implementation process and allow for ongoing evaluation of program performance and quality. This logic model is illustrated in Diagram 2.1. Table 2.10 details the program outcome indicators, associated measurement methodologies and tracking systems.

Risks associated with the Energy Poverty Reduction Program are comprehensively described in the **Project Management chapter,** which also includes the risk management strategies and associated course correction checkpoints for the program.

PROPOSED PHASING AND PAYMENT SCHEDULE

As detailed in the **Project Management chapter,** progress toward our outcomes are being consistently monitored and measured. To implement the program and achieve the outcomes described above, we propose to receive Infrastructure Canada's grant contribution in 3 installments that are closely tied to the program budget. The contribution amount will cover core program costs (development, administration, and operations, minus any municipal in-kind contribution).

The Energy Poverty Reduction Program consists of a set of 5 interconnected systems that will be deployed in 4 phases; each building off each other with some overlap in the early phases. As a small community with limited resources and no ability to draw significantly from the tax base to implement the program's development, administrative, and operating costs, we propose that each contribution will be provided up-front for the next phase of work to avoid incurring project losses or debt. Therefore, the first contribution will be at the start of the project, while the second and third contributions will be tied to achieving program outputs for Phases 1 and 2, respectively. Table 2.1 describes the timing of phases, core program costs, contribution amounts and the number of households served. Households-at-risk are less likely to also be the property owner. So the number of households served will account for both the inhabitants and the property owners. Program phases:

- **Prototype Program Setup -** This phase includes partnership and governance development; detailed service and technical design; service procurement; client consultation; establishment of risk management and quality control systems and the evaluation framework; as well as a comprehensive Privacy Impact Assessment (PIA) on the detailed program design and an overarching privacy policy.

- **Prototype Program Testing & Refinement -** This phase involves a gradual ramping up of client intake; continuing design and implementation of services and technologies; and monitoring and evaluation of results. Program outcomes become measurable by the end of this phase.

- **Final Program Activation -** This phase requires the finalization of program service design and technical components; extensive documentation of program outcomes; and the development of learning materials for other communities and senior governments. The completion of the Final Program Activation phase marks the end of Smart Cities Challenge contribution agreement.

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Program Phases, Core Costs, Contribution Conditions, and Households Served by Fiscal Year

Fiscal Year	2020-21 Year 1	2021-22 Year 2	2022-23 Year 3	2023-24 Year 4	2024-25 Year 5	2025-30 (5 years) Long-term
Phase	1: Prototype Program Setup					
		2: Prototype Program Testing & Refinement				
					3: Final Program Activation	
						4 Program Maturity
Core Program Costs Plus Contingency	$1.4 million	$1.25 million	$0.75 million	$0.8 million	$0.8 million	
Contribution Request	$2.65 million at start of year		$1.55 million at start of year		$0.8 million at start of year	
Proposed Contribution Conditions	None		Phase 1 outputs achieved		Phase 2 outputs achieved	
Households Served	0	50	75	100	125	750 over 5 years
Relationship to Smart Cities Challenge (SCC)	Within SCC Program & Funding					After SCC

Table 2.1

Coordinated Access Service Provision Activities and Outputs

Activity	Year 1	2	3	4	5	long term	Outputs
Detailed program design							• program design complete
Staff hiring & training							• staff hired & trained
Database setup							• data platform created
Program established and serving clients		50 clients	75 clients	100 clients	175 clients	750 clients	• Clients (households and/or property owners) served by program
IT system maintenance							• data and IT systems maintained (ongoing)

Table 2.2

- **Program Maturity -** This phase includes ongoing client intake; program evaluation and improvement as well as the integration of new and emerging community energy technologies and solutions.

Coordinated Access System

PROGRAM ACTIVITIES AND OUTPUTS

COORDINATED ACCESS SYSTEM PROGRAM ACTIVITIES AND OUTPUTS

This program pulls together the partner organizations and service providers required to design and deliver a successful Coordinated Access System. It also maintains relationships and information sharing between the partners. As a service that will be contracted out to a qualified third-party organization, the Town of Bridgewater will work collaboratively with its community partners to develop the scope of the service, and to establish quality control parameters and performance metrics. In doing so, we will work closely with experts and expert organizations in this field, including provincial and national agencies with interests and expertise in coordinated access services.

- **Partnership development:** partner agencies will be brought together and will sign a memorandum of understanding for engaging in the Coordinated Access System.

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Partners will be consulted through a series of workshops on the service model, process work flow, and governance structure. Existing community collaborations to leverage include the Lunenburg County Community Hub which already brings together a wide spectrum of government and non-profit service providers in a coordinated continuum of practice to support early intervention and health promotion efforts as well as to coordinate case care.

- **Program evaluation & improvement:** partners participate in ongoing program evaluation and improvement, with key service delivery partners actively participating in the evaluation process (see Overall Program Management later in this section). Evaluation will lead to periodic adjustments to the processes, policies and procedures of the service. Evaluation processes will be led and supported by staff and will involve client feedback on a regular basis.

Third party service providers will participate in an open procurement process for the provision of this service. Starting with a request for expressions of interest and culminating in a long-term service agreement, the Town of Bridgewater and its partners will assess service providers' expertise, capacity, and ability to deliver quality services that match the desired program scope. Service provision for this program may be paired with, and enhanced through, provision of Coordinated Access Services to a larger clientele than is envisioned through the Energy Poverty Reduction Program (e.g. for clients outside of Bridgewater). However, sufficient capacity and funding will need to be evident to ensure that program quality is maintained. Client services begin in 2021-22, and increase annually for each of the 3 remaining program years until the program reaches its mature state. The program partners will work closely with the service delivery organization to ensure that program quality is maintained; that information sharing and privacy obligations are met; and the program outcomes are being achieved.

- **Detailed program design:** building on the scope of work for the procured services, the service delivery partner will undertake the comprehensive design of the Coordinated Access Service. Specialized partners may be engaged in this stage, such as the Family Service of Western Nova Scotia or the Affordable Housing Association of Nova Scotia, both of which are currently active in developing coordinated access systems for their constituencies.
- **Staff hiring & training:** qualified staff, known in this program design terminology as the "Household Navigator(s)", will be hired and trained by the service delivery organization to support program design and to deliver the coordinated access service. Staff will be Clinical Social Workers who are licensed to practice in Nova Scotia. The service delivery partner will start by hiring 1.5 FTEs, which it will be able to expand to 2 FTEs by year 4. Staff will receive training in the specific clinical and administrative functions that will be required by the Energy Poverty Reduction Program, and they will be trained to use the program's data platform.
- **Database setup:** the Homeless Individuals and Families Information System (HIFIS) is readily customizable by service providers, and will be set up with the appropriate data entry forms and reporting forms required for the Coordinated Access System. As a free service with plenty of user support, this effort will be primarily carried out in-house by the Household Navigator(s), with an allowance for technical support and equipment (e.g. tablet computers for mobility).
- **Serve clients (2021 through 2030):** client service provision involves intake by the Household Navigator(s) from multiple referral points in the community, assessment and triage using a standardized intake tool (VI-SPDAT or similar), and referral to any and all community services the household may require. The Household Navigator maintains contact with

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each client, providing the level of supportive service the household requires. The Navigator maintains client information in the HIFIS database, and only shares limited information, with the client's permission, with the rest of the Energy Poverty Reduction Program.

- **IT system maintenance:** there will be ongoing maintenance of the HIFIS system database, data entry and reporting forms, and maintenance of equipment.

- **Communications & marketing:** the program partners will design and implement a Communications Strategy for the Coordinated Access System which will include the following: (1) creating a clear understanding among all partners facilitating coordination of how the Coordinated Access System will function and how to engage residents on the system; (2) roll-out and maintenance of the Communications Strategy to inform underserved populations of the system; (3) ongoing communications with partners and funders to communicate the outcomes and evaluation of the service.

Housing Energy Management System

HOUSING ENERGY MANAGEMENT SYSTEM PROGRAM ACTIVITIES AND OUTPUTS

Extensive analysis of Bridgewater's housing stock started with the Community Energy Investment Plan from 2016 to 2018. The analysis resulted in the classification of the housing stock into 32 "archetypes" based on the type, size, and age of the homes. A fully-costed retrofit program was conceptually modelled for the entire residential sector, using ambitious energy targets: greater than 50% thermal and electrical energy efficiency gains, plus the widespread addition of on-site renewables and battery storage. New construction targets were set at Net Zero Ready (NZR) or Net Zero (NZ), which the Government of Canada has established as long-term targets for the national Building Code.

The housing stock model was refined for the Energy Poverty Reduction Program. It adjusted the energy performance targets for retrofits to 60% efficiency improvement coupled with an additional 30% on-site or neighbourhood renewable energy generation. It also updated the capital costs for retrofits which were sourced from recent case data from local and provincial energy retrofit programs including the Clean Net Zero and Affordable Multi Unit Pilot programs. Connected technology solutions for both retrofits and new construction were added, and a redistribution of the housing archetypes based on extensive community surveying to identify the housing stock most affected by energy poverty was undertaken. All client properties will have access to the following energy management improvements, as long as they meet technical and financial feasibility criteria:

- On-site or neighbourhood renewable energy generation (solar hot water + solar PV)
- Highly efficient mechanical systems (targeting air source heat pumps)
- High levels of ceiling, basement and wall insulation, as well as a high degree of air sealing
- Energy efficient and smart appliances
- LED lighting
- Energy monitors, smart thermostats, and other connected technologies
- Energy management education and training

The housing infrastructure improvements function as the technical backbone of Energy Poverty Reduction Program. Energy efficiencies gained by the infrastructure improvements will be measured and monitored via the connected technology solutions discussed in detail in the **Technology chapter.** Energy and climate benefits calculated through our custom housing stock improvement model estimate 4.8 GWh of energy and 2.5 kilotonnes of greenhouse gas emissions (GHG) reduced by 2024-25, with an additional reduction of 10.1 GWh of energy and 5.9 kilotonnes of GHG emissions reduced by 2029-30 (cumulative).

- **Partnership development:** partnerships will be established with key players in the energy and housing landscape, including Efficiency Nova Scotia, Nova Scotia Power, the South Shore Housing Action Coalition, and a number

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Housing Energy Management System: Activities and Outputs

Activity	Year						Outputs
	1	2	3	4	5	long term	
Staff hiring & training							• staff hired & trained
Technical navigation services for clients							• technical navigation & support services provided
Detailed program design							• program design complete
Database setup - municipal enterprise resource planning (ERP) system							• data platform created
Database setup: energy management information system (EMIS)							• data platform created
IT system maintenance							• data and IT systems maintained (ongoing
Plan & implement retrofits and new construction		45/5	68/7	91/9	114/11	682/68	• units retrofitted/units constructed
Service & supplier procurement & coordination							• services & suppliers procured in cohorts (phase 2 onward) • performance management or procured services & suppliers (phase 2 onward) • dialogue and capacity building with related industries (phase 2 onward)
Community engagement							• clients consulted on design (phase 1) • clients consulted on prototype test (phase 2) • ongoing consultation with clients (ongoing)
Program administration							• program administration services delivered (ongoing)
Program evaluation & improvement							• program outputs and outcomes evaluated, and program improvements made (ongoing)

Table 2.3

of government agencies. Key among partner activities is the sharing of information related to energy solutions and costs. Partners may participate in the program Steering Committee, support the development, implementation, and evaluation of the program, and may provide services under contract to the program or the program's clients.

- **Staff hiring & training:** staffing for the program will consist of the following:
  - 1.5 FTE positions for the "Technical Navigator(s)" who will be technical staff with training and experience in building science and energy efficiency and at least one of whom will be a professional Engineer licensed to practice in Nova Scotia. Staff will receive training in the program's administrative and technical systems, and ongoing professional development related to community-based energy management services and large scale community energy systems.
  - 1 FTE position for an Information Systems Specialist who will support the design and management of the program data platforms including the Energy Management Information System (EMIS). Staff will receive training in related data management systems: TownSuite, EMIS, and Real Time Operations systems.

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- **Technical navigation services for clients:** services will be provided by the Technical Navigators to participating property owners. Services will begin with client intake and property registration, and depending on the property owner's needs, can involve a comprehensive suite of services including planning and assessment; monitoring and targeting; measurement and verification; performance verification; performance contracting; troubleshooting/ fault detection; risk monitoring and control; contractor coordination (turn-key services); auditing; financial planning; and energy management education services. Services will cater both to retrofits as well as to new construction.

- **Detailed program design:** led by program staff and guided by the program partners, a detailed program design will incorporate best practices in community-scale energy efficiency programming, with an eye to achieving deep energy retrofits and highly efficient new construction. Informed by leading programs in the region, from across Canada, and internationally, attention will be focused on ensuring program accessibility for clients, mitigating problems commonly faced by landlords, and on making use of emerging connected technologies such as smart submeters and smart thermostats to achieve desired energy efficiencies and related household energy savings.

- **Database setup - municipal enterprise resource planning (ERP) system:** we will work with our municipal data platform provider, TownSuite, to set up the Enterprise Resource Planning (ERP) system backbone to support the program. The ERP is described in detail in the **Technology chapter.**

- **Database setup - energy management information system (EMIS):** complementing the development of the ERP is the development of the EMIS module of the data platform. The module will interface with the ERP and provide the core energy monitoring and planning functionality of the program. Due to its complexity, the development of the core functionality of the EMIS will fully span Phases 1 and 2. The EMIS and its associated advanced functions (including real time operations systems) is described in detail in the **Technology chapter.** Technical risk involved with designing and deploying the EMIS system has been identified as a significant program risk, justifying the need for this time and effort. This is discussed in the Risk Management Section of the Project **Management chapter.**

- **IT system maintenance:** ongoing maintenance and licensing fees associated with the data platforms described above, and maintenance of equipment.

- **Service & supplier procurement & coordination:** the Technical Navigators will issue periodic calls for contractors and suppliers, collectively known as Energy Service Providers. Management of those procurements and contracts will require ongoing effort. Supply chain risk involved with procuring these services has been identified as a significant program risk, justifying the need for this time and effort.

- **Community engagement:** the Technical Navigators will be involved in engagement and consultation efforts with program clients (households-at-risk as well as property owners) both to inform program design and prototyping as well as for ongoing program evaluation.

- **Program administration:** administration of the program will involve ongoing program management, monitoring, reporting and human resource development.

- **Program evaluation & improvement:** partners participate in ongoing program evaluation and improvement, with

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key service delivery partners actively participating in the evaluation process (see Overall Program Management later in this section). Evaluation will lead to periodic adjustments to the processes, policies and procedures of the service. Evaluation processes will be led and supported by staff, and will involve client feedback on a regular basis.

- **Communications & marketing:** we will design and implement a Communications Strategy for the Housing Energy Management System which will include the following: (1) developing a marketing strategy to engage property owners and households-at-risk in the program, which will likely involve branding the program without the use of the term "energy poverty"; (2) roll-out and maintenance of the Communications Strategy to inform all clients of the service; (3) ongoing communications with partners and funders to communicate the outcomes and evaluation of the service.

RETROFITS AND NEW CONSTRUCTION

The Town of Bridgewater will engage partners to create a common vision informed by the community for the development of affordable, green, and accessible housing in Bridgewater. The Town will conduct a housing needs assessment to identify demographics, gaps in housing provision and existing housing stock. The Town will undertake steps to incorporate policies into Town plans to ensure affordable and energy efficient homes are a council priority. Regulatory structures and incentives will be put in place in accordance with recommended actions outlined in Bridgewater's Community Energy Investment Plan (2018). The Technical, Investment, and Household Navigators will provide service coordination for homeowners and those in housing need to access programs available through the Housing Energy Management System, Financial Investment Vehicle, and Coordinated Access System.

The Town will take several actions to incorporate policies, create regulatory incentive frameworks, and enable financing opportunities to ensure that retrofit and new construction meets the energy efficiency and affordability targets of our application. First, the Town's Municipal Planning Strategy (2014) will be amended to include policies for housing energy efficiency targets laid out in the Town's Community Energy Investment Plan (2018). This may include creating a specific energy efficiency overlay zone to incent retrofits, upgrades and building to higher standards than the current building code requires. Further polices will be added in support of mixed tenure, affordable housing congruent with existing policies for supporting the construction of a range of higher density, mixed-use infill development in the Town's core. The Town's criteria for evaluating proposals for land use by-law amendments and development agreements will be amended to ensure that staff and Council shall consider the energy efficiency and affordability of housing when making decisions.

As per the Town's Community Energy Investment Plan (2018) additional policies outside of the land use planning documents will be pursued. These include:

- Maintain and expand annual financing limits for Property Assessed Clean Energy Financing to incentivize property owners to build to a higher energy efficient standard, and explore opportunities to expand program eligibility to include multi-unit residential, commercial, and institutional buildings.
- Establish incentives to support and encourage highly energy efficient building practices for residential development.

In Nova Scotia, the responsibility for affordable housing lies with the provincial government through Housing Nova Scotia. Municipalities do not have a legislated requirement, but a societal expectation to provide for the needs of their residents and community. Bridgewater Town Council identified the need to play a stronger role in providing affordable housing well

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before the development of the Energy Poverty Reduction Program. But it did not have the broad community support for or deep understanding of the relationship between housing infrastructure, energy management and overall poverty to go beyond general policies of smart growth, residential infill and densification. Catalyzed by this deeper understanding of energy poverty, Council may develop policies to actively attract and support the development of affordable, energy efficient housing. This may include policies to facilitate the sale of town-owned land to a non-profit housing body for less than market value; and, to limit municipal taxes and/or fees for properties owned by a company or corporation established for the purposes of non-profit housing services.

The housing retrofit program will serve all major housing types in the community, including single detached, semi-detached, mobile home, and multi-unit resident buildings (MURBS). The Town's Community Development staff and the Technical Navigators will play a critical role in communicating these opportunities to property owners early in the development phase.

Community Energy Systems

COMMUNITY ENERGY SYSTEMS PROGRAM ACTIVITIES AND OUTPUTS

The development of utility grade services, either directly by the Town of Bridgewater, or procured through a third-party provider, has been selected as the most practical and economical pathway toward neighbourhood and community scale energy system development in Bridgewater. The activities described in Table 2.4 will be initiated by our technical project team (Project Coordinator, Technical Navigators, and Investment Navigator), with the support of externally-procured consultation and engineering services.

- **Technical resource assessment:** expanding on the preliminary work completed through the Community Energy Investment Plan, a detailed technical review of energy consumption and various energy generation sources (solar, wind, hydro etc.) will be assessed. This process will involve independent analysis of various renewable resources, and the cost to produce energy. Paramount to this step will be assessing fit between consumption patterns and renewable generation technologies, as poorly matched generation and consumption patterns can lead to technical and financial inefficiencies, and increase the requirement of energy storage.

- **Municipal utility detailed service design:** the first step of investigating and establishing a Municipal Utility Grade Service will be to establish the scope and design frame of this approach. In general, utility grade service can involve the generation, distribution and sales of electricity, data collection and assessment, and integration of connected technology such as demand control, sensors and energy storage. This first step will involve both a technical and a legal/regulatory review to define scope, best practices and to specific regulations and applications required.

- **Municipal utility setup and/or service procurement:** the most important part of this scope will be facilitating agreement with the incumbent utility, Nova Scotia Power. While the scope of utility service provision can vary significantly, there will always have to be a significant interaction with NS Power at the point of interface. This discussion would include such items as transmission and distribution system access, top up and spill provisions, emergency response, grid ancillary services and administration. The commercial terms of this agreement will have a major impact on the financial variability of power generation and sales in the community. An additional aspect to this set up process is determining the entity that performs this service. Three options exist: (1) expand existing municipal utility, (2) new stand-alone new municipal utility, and (3) a public-private partnership (P3)

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arrangement for service provision to a municipal utility.

- **Legislative and regulatory approval process:** while the regulatory process is defined, agreements will have to be in place with NS Power in order to proceed with any certainty through the application process. Of the three types of service noted above, only the generation and distribution of electricity is currently contemplated by the *Public Utilities Act*. Value added services through data and control of connected technologies such as demand control and energy storage would not require the regulatory process of establishing a municipal utility.

- **Database setup:** as detailed in the **Technology chapter,** the Energy Management Information System will be set up in such a way as to ensure future compatibility with community energy systems. While detailed IT integration in this regard cannot be completed until the time the specific technology is installed, a number of important functional components need to be prepared in the EMIS to enable this integration down the road.

- **Utility grade service management:** once all of the above is complete, Bridgewater will be in a position to offer utility grade energy services. With careful attention to financial considerations as discussed in the **Financial chapter,** work can begin in capitalizing the utility and providing service.

Community Energy Systems: Utility Grade Service Provision Activities and Outputs

Activity	Year						Outputs
	1	2	3	4	5	long term	
Technical resource assessment							• community-wide energy generation feasibility study complete
Municipal utility detailed service design							• utility grade services designed
Municipal utility setup and/or service procurement							• municipal utility established
Legislative & regulatory approval process							• legislative & regulatory approvals achieved
Database setup							• data platform created
Utility grade service management							• municipal utility services delivered (ongoing)

Table 2.4

SOLAR GARDEN DEVELOPMENT

The development of a community-owned "solar garden" has been selected as the preliminary technology for the neighbourhood-scale energy system for the Energy Poverty Reduction Program, as early assessments have suggested that such a system would lend itself well to delivering the outcomes proposed under this program. However, the final selection of the energy technology will be contingent on the outcome of the technical resource assessment described on the previous page. We are anticipating approximately 6MW of Community Solar Garden to be built in the first 5 years of our program. This will start in year 3, and supply the remaining load from the Housing Retrofit homes as well as 75-200 additional customers per year from the community. Each annual addition of solar generation capacity would be financed, so that payments made by the customers would cover the loan on the project. More detail on this and ownership structures can be found in the in the **Financial chapter.**

Conceptual design: a detailed assessment of the size and scale of the solar community garden would first be conducted. It would grow annually as more retrofits are completed. This stage

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would also consider if additional community participation to that of the neighbourhood retrofits could be considered. The end result of this stage should be a detailed financial proforma for each year's installation, along with the cumulative cashflows of the facility.

Fundraising & financing: this stage will span the project schedule from start to operation. Different types of financing will be available at different stages of project development. The various contracts with customers for the sale of power from the facility will be the key asset upon which the community entity can raise the equity and debt investment for the project. More information is available in the **Financial chapter.**

Community consultation: early and open transparency regarding project location, timelines, construction and environmental impact will be essential to this project's social acceptance. Open house style engagements have proven to work well with previous renewable energy projects in Nova Scotia of a similar scale (ie. COMFIT, SolarCity).

Detailed engineering design: once the concepts and project financing are established, detailed engineering design will take place. This will involve geotechnical, structural, and electrical design. There are many firms with local representation that have experience in design projects of similar sizes, and public procurement of these services will take place.

Permitting: permitting requirements for the project will include municipal, electrical utility and any additional environmental permissions.

Procurement: procurement will take place in stages as solar garden components are funded over 3 consecutive years. The market for renewable energy equipment is well established in Canada and globally. Costs can vary over time due to market efficiencies and changes in tariffs. Delivery schedule is usually tied to the placement of a firm order and can range from three months to two years, though for a smaller solar project 1-2MW in size at a time it is expected be on the shorter end of that timeframe. Placing an order for equipment will also require deposits to be paid.

Construction: the solar garden would be ground mounted with power generated collected to common points and connected to the NS Power electrical system. Major scopes of work for construction would be: (1) supply of panels and related equipment, (2) civil/roads, (3) structural (foundations and racking), electrical installation, and commissioning/testing. It is common that many of these scopes be combined into a generation contractor agreement, or an Engineer, Procure, Construction (EPC) contract.

Community Energy Systems: Solar Garden Development Activities and Outputs

Activity	Year						Outputs
	1	2	3	4	5	long term	
Conceptual design							• conceptual design complete
Fundraising & financing							• financing & funding targets achieved
Community consultation							• community consultants complete
Detailed engineering design							• detailed engineering design complete
Procurement							• services & suppliers procured
Permitting							• permits achieved
Construction							• construction complete
Database & IT systems setup							• IT systems installed
Commissioning							• commissioned
Operation & maintenance							• maintained (ongoing)

Table 2.5

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Database & IT systems setup: all modern community scale energy generation systems come with internet addressable controls systems. It will be important to ensure that data from this system can be integrated to the Town's EMIS. Generally, this interaction is undertaken with the solar technology provider.

Commissioning: the designer and installers of the solar garden will take on performance risk of the installation, to help make sure that the solar garden performs properly before the Town and the project investors accepts the installation in to operation.

Operation & maintenance: modern solar energy systems come with 25 year warranties on panels, and 10 years+ on other components such as racks and inverters. The community solar garden will contract for spare parts provisions and maintenance service provision, as well as for operational oversight.

Mobility Improvement System

MOBILITY IMPROVEMENT SYSTEM PROGRAM ACTIVITIES AND OUTPUTS

This service receives client mobility information from the Housing Energy Management System through the Technical Navigators, and from the Coordinated Access System through the Household Navigators, and uses it to plan and implement transportation improvements in the community. Implementation of improvements must be approved by Town Council through annual budgeting processes, and if approved are implemented by the Bridgewater Transit system and Engineering Department. While the program is focused on transit and active transportation modes at this time, future integration with rideshare and paratransit services is a real possibility that would be further enhanced through the planning functionality provided by this program.

- **Detailed program design:** planning staff will work with community partners to finalize the program scope and develop its technical methodologies. This will take place over a two-year timeframe to ensure integration with the overall program data platform, and to involve the first year of program clients directly in the design process.

- **Partnership development:** partnerships will be established with key players in the transportation and accessibility landscape, including members of the Bridgewater Active Transportation Committee, a standing Committee of Council with strong ties to community service providers.

- **Database setup:** the municipal enterprise resource planning components of the municipal data platform will be expanded to include a Client Mobility Application module. This will link with the existing Land Management GIS module to enable transportation planning through the use of spatial data from other parts of the system. Specifically, the civic addresses of program clients will be linked with transit and active transportation routing maps, and made to perform transportation planning calculations, including walking distance to the nearest bus stop and sidewalk or trail network. Mobility indicators are tracked by neighbourhood, with the goal of seeing improvement over time as enhancements are made.

- **IT system maintenance:** ongoing maintenance and licensing fees associated with the data platforms described above, and maintenance of equipment.

- **Community engagement:** staff will be involved in engagement and consultation efforts with program clients (households-at-risk as well as property owners) to inform program design and prototyping as well as for ongoing program evaluation.

- **Communications & marketing:** we will design and implement an

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Mobility Improvement System: Program Coordination & Administration Activities and Outputs

Activity	Year						Outputs
	1	2	3	4	5	long term	
Detailed program design							• program design complete
Partnership development							• partnership established
Database setup							• data platform created
IT system maintenance							• data and IT systems maintained (ongoing)
Community engagement							• clients consulted on design (phase 1) • clients consulted on prototype test (phase 2) • ongoing consultation with clients (ongoing)
Program administration							• program administration services delivered (ongoing)
Program evaluation & improvement							• program outputs and outcomes evaluated, and program improvements made (ongoing)

Table 2.6

improved Communications Strategy for the community's transit and active transportation systems, which will include the following: (1) developing a marketing strategy to engage residents in the program, which will build on engagement recommendations from the renewed Active Transportation & Connectivity Plan; (2) roll-out and maintenance of the Communications Strategy; (3) ongoing communications with partners and funders to communicate the outcomes and evaluation of the service.

- **Program evaluation & improvement:** partners participate in ongoing program evaluation and improvement, with key service delivery partners actively participating in the evaluation process (see Overall Program Management later in this section). Evaluation will lead to periodic adjustments to the processes, policies and procedures of the service.

TRANSIT SYSTEM IMPROVEMENTS

Bridgewater Transit has been operating successfully since 2017. As a new municipal service, improvements to transit routing and service delivery have been occurring on a regular basis. The transit service can benefit substantially from the enhanced planning functionality provided through this program.

Transit service improvement planning includes: making periodic routing adjustments, improving transit service accessibility, quality improvement measures, improvements to communications and marketing systems, and the integration of connected technology functions to the bus service. Already, a GPS locator in the bus allows for real-time tracking of the bus for the public. Additional service and communication enhancements based on connected technologies may include the development of client notification, survey, and complaint functions, as well as opportunities to provide real-time transit information to service providers including agencies that support under-served residents. Transit improvements are subject to Council approval on an annual basis. Transit service improvements will be documented and evaluated on an ongoing basis.

ACTIVE TRANSPORTATION IMPROVEMENTS

Active transportation planning and evaluation efforts can benefit substantially from the enhanced planning functionality provided through this program. Active transportation improvements will build on the recommendations and solutions provided through Town's Active Transportation and Connectivity Plan, which was developed in 2008 and which will be comprehensively renewed in 2019.

The nature of AT infrastructure improvements will depend entirely on the neighbourhoods that

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are selected for priority improvement. A budget has been proposed that represents approximately double the Town's current annual budget for these annual improvements. The budget allows for a combination of neighbourhood-based AT improvements, such as the installation of new sidewalks, replacement or upgrade of existing sidewalks, improved crosswalk paint and accessibility infrastructure, the addition of lighting in underlit areas, and making improvements to the Town's trail systems. AT improvements are subject to Council approval on an annual basis. Improvements will be documented and evaluated on an ongoing basis.

Investment System

MUNICIPAL CAPITALIZATION SYSTEM

This system provides core financial budgeting and capitalization services to the other program services. It is responsible for "specialized finance" stacking, assembling project opportunities and outcomes, and reporting to funders. It interfaces closely with the Financial Investment Vehicle, which brings additional private investment into the program. This program is explained in detail in the **Financial chapter** of this proposal.

- **Detailed program design:** program design will be carried out primarily by the Investment Navigator with the support of the program partners. Program design ensures that both the municipal capitalization system and the financial investment vehicle systems work cohesively and with fluidity. In order to do so, workflows and timelines need to be well-established. Focus groups and a gap analysis will determine the missing capacity to deliver on investment system outcomes, and controls designed to ensure operations do not derail.

- **Database setup:** the municipal database is to be defined and created in parallel with the detailed program design. The municipal enterprise resource planning platform will allow this financial budgeting and reporting functionality. Database requirements will be clearly articulated to the development team, and the developer and Town will correspond throughout the development process. The developer will receive a list of necessary components, and a testing team composed of various stakeholders, both internal and external to the Town, will be sourced to test its functionality.

- **Staff hiring and training:** staffing for this service will consist of 1 FTE position for the "Investment Navigator" who will have training and experience in financial management, analysis, and budget development, with preference given to someone with a background in large scale project finance and investment and an interest in the clean tech-sector and project-aligned social values. Staff will receive training in the program's administrative and technical systems, and ongoing professional development related to community-based financial planning services.

- **Partnership Development:** partnerships will be developed with three key groups: funders, investment vehicle services, and community capacity building organizations. The Investment Navigator will approach federal, provincial, and philanthropic funders to ensure robust funding streams are explored. Investment vehicle service partners are needed to set up and deliver the external investment vehicle described below. Community capacity building partners include local credit unions that are willing to act as financial literacy support organizations for program clients. Partners may participate in the program Steering Committee, and will support the development, implementation, and evaluation of the program.

- **Project financial planning:** on an ongoing basis, staff will calculate funding requirements for projects defined and projected by the Energy Poverty Reduction Program, and pool together project components into capitalizable groupings that are attractive

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to traditional, community, and specialized investors. This budgeting exercise will be facilitated by partnership opportunities established through partnership development activities and will rely on the database module developed for the program. Dynamic data sharing with the Financial Investment Vehicle is a key activity throughout the planning stage.

- **Plan, confirm and administer funding (2021 through 2030):** once specific projects are identified and pooled into groups, the Investment Navigator seeks specific funders to commit to those investment raises, until funding targets are met. Understanding that most funders operate on annual budgets, a recurring approach to raising specialized sources of capital will be undertaken. Annual administrating tasks include updating the database and reconciling accounts.

- **Reporting to funders:** reporting will be automated to the greatest extent possible to allow for real-time monitoring of project outcomes specifically pertaining to funding obligations. It is expected that each source will require different reporting criteria and on different schedules. These activities will be administered by the Investment Navigator.

Investment System: Municipal Capitalization System Activities and Outputs

Activity	Year						Outputs
	1	2	3	4	5	long term	
Detailed program design							• program design complete
Database setup							• data platform created
Staff hiring & training							• staff hired & trained
Partnership development							• partnership established
Project financial planning							• project financial planning completed (ongoing)
Plan, confirm, and administer funding 2021-30		$1.71	$2.28	$3.03	$3.83	$25.82	• millions raised in project funding from specialized investors
Reporting to funders							• project reporting needs satisfied (ongoing)
IT system maintenance							• data and IT systems maintained (ongoing)
Program evaluation & improvement							• program outputs and outcomes evaluated, and program improvements made (ongoing)

Table 2.7

- **IT system maintenance:** ongoing maintenance and licensing fees associated with the data platforms and maintenance of equipment.

- **Program evaluation and improvement:** partners participate in ongoing program evaluation and improvement, with key service delivery partners actively participating in the evaluation process (see Overall Program Management later in this section). Evaluation will lead to periodic adjustments to the processes, policies and procedures of the service. For example, it is expected that new technologies, financing mechanisms, and funding sources will evolve throughout the 10-year program and arrangements that were once not well suited may become more feasible over time. Evaluation processes will be led and supported by the Investment Navigator, and will involve client feedback on a regular basis.

FINANCIAL INVESTMENT VEHICLE

This program complements the Municipal Capitalization System but is external to the Town of Bridgewater, with services procured through

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an existing or new organization. The program is responsible for traditional financing (inclusive of community investments), cash disbursements through outcome-data shared by the municipal capitalization system, investing in energy poverty reduction program assets, and reporting to investors. This program is explained in detail in the **Financial chapter** of this proposal.

Investment System: Financial Investment Vehicle Activities and Outputs

Activity	Year						Outputs
	1	2	3	4	5	long term	
Investment vehicle organization creation and/or service procurement							• investment vehicle organization created
Administration & Reporting							• administration & reporting services delivered (ongoing)
Plan, sell, and administer investment raise 2021-30		$0.74	$7.69	$9.0	$8.86	$10.78	• millions raised in project financing from financial investors

Table 2.8

- **Investment vehicle organization creation and/or service procurement:** an organization that provides the best value to the Town and the Energy Poverty Reduction Program is procured. Target services include: the ability to set up community-based investment vehicles and organizational structures (see **Financial chapter** for details) the capacity to source traditional and community financing, adherence to appropriate best practices, and utilization of a comprehensive data-security and privacy plan. A unique organizational structure must be incorporated, appropriate bylaws must be drafted, and a governance structure that aligns with the Town's needs must be set up. Once sourced or built, an agreement with the Town must be drafted and executed. To support this service procurement process, financial investment vehicle and investor-related service delivery partnerships will be explored early in the partnership development process. For the purpose of this application the MaRS Centre for Impact Investing, whose SVX platform connects investment opportunities with impact investors, is being considered as a useful template for this service.

- **Administration and reporting:** Reporting should be automated to the greatest extent possible and allow for real-time monitoring of project outcomes specifically pertaining to what the funding source needs to access. It is expected that each traditional source will require different reporting criteria and varying schedules. These activities and the deployment of funds will be administered by the organization with data shared between the Municipal Capitalization System and the Financial Investment Vehicle.

- **Plan, sell, and administer investment raises (2021 through 2030):** activities are dependent on the two financing streams: traditional and community. Both require separate offering terms, due diligence activities and marketing narratives. The organization will be responsible for sourcing traditional debt investments paired with equity raises. These raises will be enhanced through third-party data and connected technology applications. Raising funds involves the development of a marketing strategy, inclusive of buying cycle projections, an elevator pitch and lead nurturing strategies. Investor onboarding activities continue throughout the "raise" and "manage" cycle and include subscription processing, and investor and financial institution correspondence. Monitoring investor satisfaction is a key component to ensuring investment raises are sustainable year-to-year. Additional information is provided in the **Financial chapter.**

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EVALUATION MODEL

In the Energy Poverty Reduction Program, there are multiple stakeholders and partners, a need to make quick decisions, prototyping of new programs, and high levels of uncertainty. Developmental evaluation is appropriate for this type of work because the governance and management team are ready and willing to test new approaches and make changes along the way to reach the goal of energy poverty reduction. Using these evaluation methods will allow the opportunity to blend qualitative and quantitative reporting.

As the evaluation process will be in tune with the evolving program dynamics, achievements, and struggles, it also plays an important role in the design and implementation of the program's risk management strategy and associated course correction checkpoints, which are described in the **Project Management chapter.**

Overall Program Management: Evaluation Framework

Phase	1: Prototype Program Setup	2: Prototype Program Testing & Refinement	3: Final Program Activation	4: Program Maturity
Ongoing Project Evaluation Priorities		• Continuous reflection of role clarification • Partner relations • Guiding principles • Project structure	• Quality of learning cultures • Existing and new project teams • Responsiveness • Moments of innovation	
Phase-Specific Evaluation Priorities	Design by Core Team • Partners – clarification of roles • Identify and build relationships with individual champions • Identify expertise of identified partners • Identify guiding principles and clarity of project charter • Leverage historical experiences • Establishment of project structure • Encouraging and identifying innovations in project design	Early Changes • Highlight new and emerging leadership • Consider internal and external creative tensions • Revisit guiding principles • Review lessons learned • Review and adapt project structure • Document innovations from prototyping • Consider emerging risk • Scaling project • Anticipate blocks to progress	Systems Changes • Revisit guiding principles • Review and adapt project structure • Leverage learned innovations • Establishment of ongoing project charter • The establishment of ongoing structure	Population Changes • New partners: funding, human resources, skills, leadership. • Operationalize the innovations
Desired Outcomes	• Project charter providing useful guidance • Core team/participants report feeling engaged in project • Systems to direct the project are established and useful	• New collaborations consistent with Guiding Principles are established • New funding and financing opportunities are identified • The practical usefulness of data collection systems are improved	• New resident and partner-informed programs and process are developed • New volunteer and agency leadership is engaged • Local collaborations to sustain impact post project are established	• Reducing Energy Poverty is considered a local 'movement' rather than a project • Residents pulled out of energy poverty are championing the impact • Local agencies, institutions and organizations are supporting counterparts in other jurisdictions to make changes to decrease EP.
Evaluation Outputs for Infrastructure Canada	• Phase 1 output report. Key output target: program governance, management, and evaluation systems in place	• Phase 2 output report • Phase 2 preliminary outcomes report	• Phase 3 output report. Key output target: Phase 3 program outputs and outcomes evaluated • Phase 3 final outcomes report	• Phase 4 output and outcomes reporting not applicable to Infrastructure Canada under this funding agreement

Table 2.9

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Energy Poverty Reduction Program Outcomes Logic Model

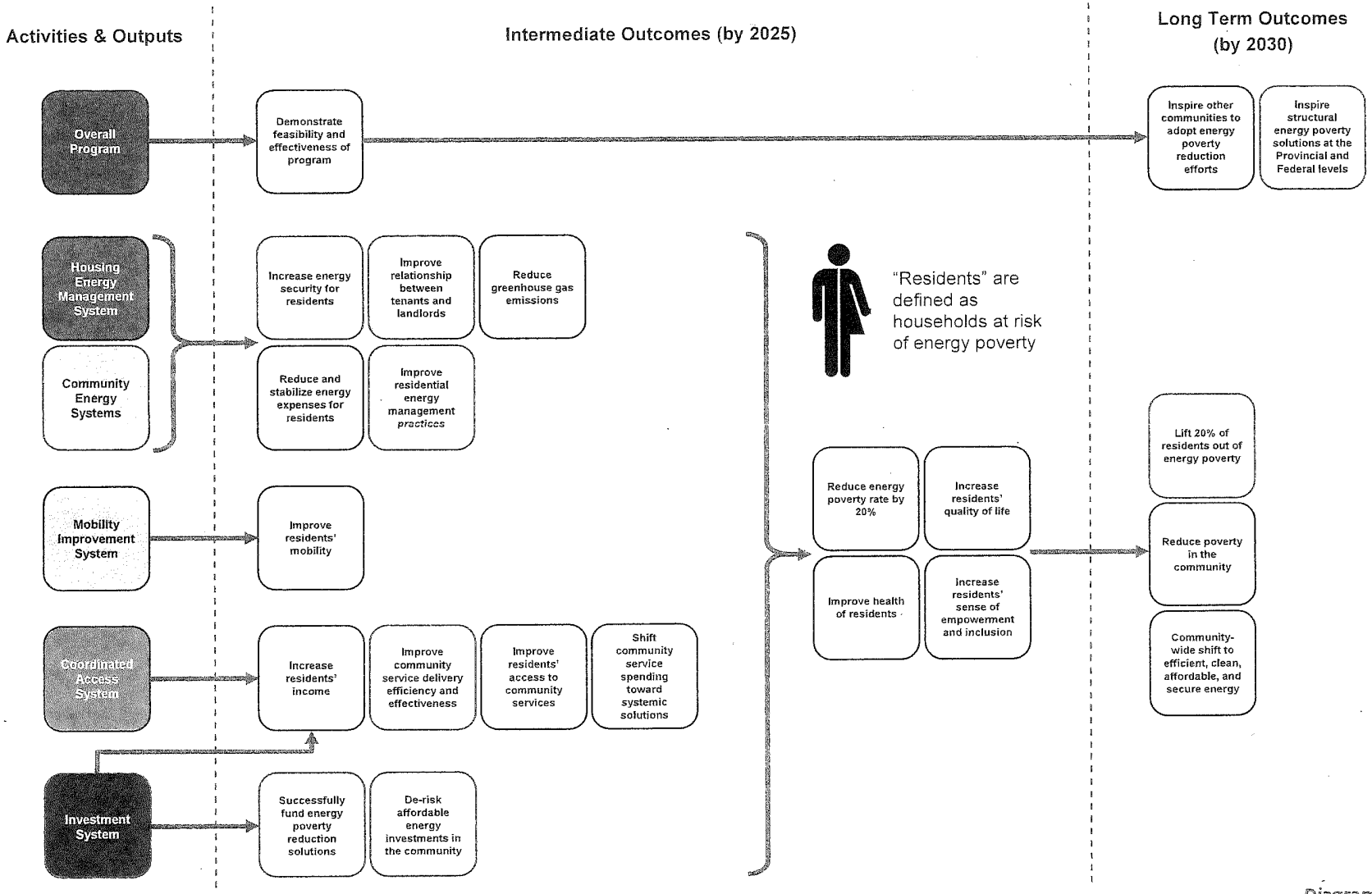


Diagram 2.1

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PROGRAM OUTCOMES AND INDICATORS

The program activities and outputs described in the preceding section are expected to result in a set of 22 intermediate and long-term outcomes that benefit the program clients, program stakeholders, the community as a whole, the environment, and ultimately communities beyond Bridgewater. Diagram 2.1 summarizes the Energy Poverty Reduction Program outcomes logic model. Outcomes displayed in the "intermediate outcome" section of the Diagram 2.1 will be demonstrated by 2025. While the benefits of these outcomes will continue to accrue past the Smart Cities Challenge program an additional set of 5 long-term outcomes are displayed in the final section of the chart, indicating our community's continued benefits from the program.

Indicators chosen for each outcome are meaningful, measurable and monitorable via data collected through the program itself, through regular community-wide surveys or from Statistics Canada census information.

Program Outcome Indicators and Associated Measurement Methodologies, Sources, and Tracking Systems

Outcome Category	Outcome	Performance Indicator	Baseline		Target		Methodology	Source	Tracking Program / System
			Year	Value	Year	Year			
Reduced poverty & improved wellbeing	1. Reduce energy poverty rate	Percent of households living in energy poverty	2018-19	38.5% (1,613 of 4,194)	2024-25	30.6% (1,362 of 4,452) = 20% rate reduction	Percent of households who self-report spending more than 10% of after-tax income on energy for the home and transportation and currently experiencing energy poverty. Measured through bi-annual community-wide survey. Percentages are based on projected future household growth as calculated in the Community Energy Investment Plan, with a basis in the 2016 Census.	Bi-annual community-wide Housing, Energy, and Transportation survey, to be conducted in 2028-29. Data stored on municipal platforms.	Overall Program
					2029-30	14.4% (660 of 4,577) = 62% rate reduction			Overall Program
	2. Reduce poverty	Percent of households living in core housing need	2016-17	27.9% (1,135 of 4,075)	2026-27	Decrease from baseline	Percent of households living in core housing need. A household is said to be in 'core housing need' if its housing falls below at least one of the adequacy, affordability or suitability standards and it would have to spend 30% or more of its total before-tax income to pay the median rent of alternative local housing that is acceptable (meets all three housing standards).	Census data (Statistics Canada). Target year will use 2026 Census.	Overall Program
	3. Improve health of residents	Amount of time program clients are able to meet their thermal comfort needs at home	Property intake year	Average property intake value	2024-25	Increase from baseline	Number of days per year that homes inhabited by program clients are sufficiently heated or cooled to a minimum level necessary for physical wellbeing. Subtracts the number of days that the temperature in main living area drops below 16 degrees C (threshold for respiratory illness) and 12 degrees C (threshold for cardiovascular illness), or above 27 degrees C (threshold for heat related illness) for a sustained period while occupants are home. Performance measured through change from baseline, pooled by property cohort (intake year).	Home energy monitoring system reports aggregated home temperature data. Data stored on municipal platforms.	Housing Energy Management System

Table 2.10

CONTINUED

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Outcome Category	Outcome	Performance Indicator	Baseline		Target		Methodology	Source	Tracking Program / System
			Year	Value	Year	Year			
Reduced poverty & improved wellbeing	3. Improve health of residents	Thermal comfort of program clients	Client intake year	Average client intake score	2024-25	Increase from baseline	Overall thermal satisfaction over the past year, based on a scale from 1 (very dissatisfied) to 10 (very satisfied). Self-reported assessment by client households. Performance measured through change from baseline, pooled by client cohort (intake year).	Client wellbeing survey facilitated by Household Navigator. Initial intake, followed by periodic updates. Data stored on HIFIS.	Coordinated Access System
		Energy poverty-correlated population health index	2020-21	To be determined	2024-25	Improvement from baseline	Customized index of population health indicators to be designed and monitored by the Nova Scotia Health Authority using deidentified health system data. See letter of support.	Information to be collected and analysed by Nova Scotia Health Authority.	Coordinated Access System
	4. Increase residents' quality of life	Satisfaction of life in general for program clients	Client intake year	Average client intake score	2024-25	Increase from baseline	Satisfaction of life in general on a scale from 1 (very dissatisfied) to 10 (very satisfied). Self-reported assessment by client households. Performance measured through change from baseline, pooled by client cohort (intake year).	Client wellbeing survey facilitated by Household Navigator. Initial intake, followed by periodic updates. Data stored on HIFIS.	Coordinated Access System
	5. Increase residents' sense of empowerment and inclusion	Frequency of social contact for program clients	Client intake year	Average client intake score	2024-25	Increase from baseline	Percentage of time in the past year that the client reports contact 'once a week or more' with relatives and/or friends. Self-reported assessment by client households. Performance measured through change from baseline, pooled by client cohort (intake year).	Client wellbeing survey facilitated by Household Navigator. Initial intake, followed by periodic updates. Data stored on HIFIS.	Coordinated Access System
		Sense of belonging for program clients	Client intake year	Average client intake score	2024-25	Increase from baseline	Sense of belonging to the local community on a scale from 1 (very weak) to 10 (very strong). Self-reported assessment by client households. Performance measured through change from baseline, pooled by client cohort (intake year).	Client wellbeing survey facilitated by Household Navigator. Initial intake, followed by periodic updates. Data stored on HIFIS.	Coordinated Access System
	6. Increase energy security for residents	Amount of time program clients are able to meet their home energy needs	Property intake year	Average property intake value	2024-25	Increase from baseline	Number of days per year that homes inhabited by program clients are sufficiently powered, heated, or cooled to a minimum level necessary for physical and mental wellbeing. Performance measured through change from baseline, pooled by property cohort (intake year).	Home energy monitoring system issues alert on days that the home is unpowered or minimal thermal comfort levels are not met. Data stored on municipal platforms.	Housing Energy Management System

Table 2.10

CONTINUED

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PERFORMANCE MEASUREMENT

Outcome Category	Outcome	Performance Indicator	Baseline		Target		Methodology	Source	Tracking Program / System
			Year	Value	Year	Year			
Better Housing	7. Reduce and stabilize energy expenses for residents	Spending on shelter by program clients	Client intake year	Average client intake value	2024-25	Decrease from baseline	Total annual spending on shelter by program clients (as applicable: rent, mortgage, insurance, property tax, maintenance, utilities, and energy contracts). Self-reported assessment from client households. Performance measured through change from baseline, pooled by client cohort (intake year).	Client wellbeing survey facilitated by Household Navigator. Initial intake, followed by periodic updates. Data stored on HIFIS.	Coordinated Access System
		Affordability of housing energy costs	2018-19	37.4%	2024-25	Decrease from baseline	Percent of households who self-report having difficulty affording their home energy costs. Measured through bi-annual community-wide survey. Percentages are based on projected future household growth as calculated in the Community Energy Investment Plan, with a basis in the 2016 Census.	Bi-annual community-wide Housing, Energy, and Transportation Survey, to be conducted in 2024-25. Data stored on municipal platforms.	Overall Program
		Cost of home energy for participating properties	Property intake year	Average property intake value	2024-25	Decrease from baseline	Annual cost of all energy types consumed by homes inhabited by program clients, adjusted for annual climatic variability (heating degree days). Performance measured through change from baseline, pooled by property cohort (intake year).	Home energy monitoring system reports aggregated home energy consumption and cost data. Data stored on municipal platforms.	Housing Energy Management System
	8. Improve relationship between tenants and landlords	Level of trust between tenants and landlords - tenant perspective	Client intake year	Average . client intake value	2024-25	Increase from baseline	Perception of trust in the landlord based on a scaled rating system on a scale from 1 (very low level of trust) to 10 (very high level of trust). Self-reported assessment from client households. Performance measured through change from baseline, pooled by client cohort (intake year).	Client wellbeing survey facilitated by Household Navigator. Initial intake, followed by periodic updates. Data stored on HIFIS.	Coordinated Access System
		Level of trust between tenants and landlords - landlord perspective	Property intake year	Average property intake value	2024-25	Increase from baseline	Perception of trust in the tenant(s) based on a scaled rating system on a scale from 1 (very low level of trust) to 10 (very high level of trust). Self-reported assessment from client property owners or their property managers. Performance measured through change from baseline, pooled by property cohort (intake year).	Property owner survey facilitated by Technical Navigator. Initial intake, followed by periodic updates. Data stored on municipal platforms.	Housing Energy Management System
	9. Improve residential energy management practices	Cost savings resulting from energy management practices for participating properties	Property intake year	Average property intake value	2024-25	Increase from baseline	Total annual cost savings as compared to baseline energy consumption resulting directly from energy management practices (manual + automated) as calculated by home energy monitoring & control system. Accompanied by a property owner & tenant survey on energy conservation practices that is used to illustrate / educate opportunities for improved energy management. Performance measured through change from baseline, pooled by property cohort (intake year).	Home energy monitoring system reports aggregated home energy savings data. Property owner survey & tenant facilitated by Technical Navigator. Initial intake, followed by periodic updates. Data stored on municipal platforms.	Housing Energy Management System

Table 2.10 *CONTINUED*

Processed under the provisions of the Access to Information Act / Révisé en vertu de la Loi sur l'accès à l'information

PERFORMANCE MEASUREMENT

Outcome Category	Outcome	Performance Indicator	Baseline		Target		Methodology	Source	Tracking Program / System
			Year	Value	Year	Year			
Increased Mobility	10. Improve residents' mobility	Community-wide transit ridership	2018-19	27,000 annual riders	2024-25	43,000 annual riders	Daily average transit ridership. Includes all passenger types.	Ridership counted hourly by bus drivers. Data stored on municipal platforms.	Mobility Improvement System (MIS)
		Mobility self-assessment rating by program clients	Client intake year	Average client intake value		Increase from baseline	Ease of mobility based on a scale from 1 (very low mobility) to 10 (very high mobility). Self-reported assessment from client households. Performance measured through change from baseline, pooled by client cohort (intake year).	Client wellbeing survey facilitated by Household Navigator. Initial intake, followed by periodic updates. Data stored on HIFIS.	Coordinated Access System
		Affordability of transportation energy costs	2018-19	25.5%	2024-25	Decrease from baseline	Percent of households who self-report having difficulty affording their transportation energy needs. Measured through bi-annual community-wide survey. Percentages are based on projected future household growth as calculated in the Community Energy Investment Plan, with a basis in the 2016 Census.	Bi-annual community-wide Housing, Energy, and Transportation Survey, to be conducted in 2024-25. Data stored on municipal platforms.	Overall Program
More effective community services	11. Improve residents' access to community services	Level of satisfaction with access to community services for program clients	Client intake year	Average client intake value	2024-25	Increase from baseline	Satisfaction with access to community services based on a scaled rating system on a scale from 1 (very dissatisfied) to 10 (very satisfied). Self-reported assessment from client households. Performance measured through change from baseline, pooled by client cohort (intake year).	Client wellbeing survey facilitated by Household Navigator. Initial intake, followed by periodic updates. Data stored on HIFIS.	Coordinated Access System
	12. Improve community service delivery efficiency and effectiveness	Self-assessment rating by Coordinated Access System partners	2020-21	To be determined	2024-25	Increase from baseline	Self-assessment rating using Coordinated Access System (CAS) Scorecard Guide which is a 23 question self-assessment tool to assist communities to take a snapshot local progress towards a quality Coordinated Access System.	Annual survey of coordinated access system partners facilitated by Household Navigator. Data stored on Coordinated Access System service provider server.	Coordinated Access System
	13. Shift community service spending toward systemic solutions	Percent of resources spent making emergency energy payments on behalf of clients, compared to other areas of support	2020-21	To be determined	2024-25	Decrease from baseline	Percent of annual dollars spent making emergency energy payments on behalf of clients, compared to other areas of support, for all service organizations that provide emergency energy funding for program clients.	Annual survey of coordinated access system partners facilitated by Household Navigator. Data stored on Coordinated Access System service provider server.	Coordinated Access System

Table 2.10

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PERFORMANCE MEASUREMENT

Outcome Category		Performance Indicator	Baseline		Target		Methodology	Source	Tracking Program / System
			Year	Value	Year	Year			
Increased economic access & participation	14. Increase residents' income	Earnings from participation in energy systems by program clients	2020-21	To be determined	2024-25	Increase from baseline	Total annual dividends and other cashflow paid out to self-identified program clients from local energy investments.	Annual report on community investors produced by Financial Investment Vehicle. Data *stored* on Financial Investment Vehicle platform.	System
	15. Increase residents' participation in the green economy	Earnings from employment in the clean tech sector by program clients	Client intake year	Average client intake value	2024-25	Increase from baseline	Annual earnings from employment in the clean tech sector. Self-reported assessment from client households. Performance measured through change from baseline, pooled by client cohort (intake year).	Client wellbeing survey facilitated by Household Navigator. Initial intake, followed by periodic updates. Data stored on HIFIS.	Coordinated Access System
Achieved Climate Targets	16. Reduce greenhouse gas emissions	Greenhouse gas emissions from participating homes	Property intake year	Average property intake value	2024-25	Increase from baseline	Number of days per year that homes inhabited by program clients are sufficiently powered, heated, or cooled to a minimum level necessary for physical and mental wellbeing. Performance measured through change from baseline, pooled by property cohort (intake year).	Home energy monitoring system reports aggregated home energy consumption and emissions data. Data stored on municipal platforms.	Housing Energy Management System
	17. Community-wide shift to efficient, clean, affordable, and secure energy	Achieve the goals of the Community Energy Investment Plan	2016-17	2016 performance values	2024-25	Decrease from baseline	Key performance metrics articulated in the plan include: (1) community-wide energy consumption, (2) community-wide greenhouse gas emissions, (3) community-wide spending on energy, (4) community-wide investment in energy improvements, and (5) job creation resulting from energy investments. Implementation of the Energy Poverty Reduction Program will contribute strongly toward achieving these outcomes.	Annual indicator update by Planning & Recreation Department staff, and update of CEIP model and targets every 5 years. Data stored on municipal platforms.	Overall Program
Investment in communities	18. De-risk affordable energy investments in the community	Investment leverage ratio of capital improvement projects funded by the program	2020-21	To be determined	2024-25	To be determined	The ratio of all public instruments versus private sector investment in the program's capital projects (housing, transportation, and community energy systems). As both the costs of the public instruments as well as the energy investments occur over time, the present value of the costs and investments are used to calculate the investment leverage ratio. It is currently unclear what investment leverage ratio would be considered ideal for the program. This metric will be investigated during the program design stage.	Annual indicator update by Investment Navigator. Data stored on municipal platforms.	Investment System

Table 2.10

CONTINUED

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PERFORMANCE MEASUREMENT

Outcome Category	Outcome	Performance Indicator	Baseline		Target		Methodology	Source	Tracking Program / System
			Year	Value	Year	Year			
Investment in communities	18. De-risk affordable energy investments in the community	Carbon abatement cost of capital improvement projects funded by the program	2020-21 Property intake year	To be determined	2024-25	Decrease from baseline	The present value of the incremental costs of the energy project investments divided by the greenhouse gas emission reduction potential. Reported as dollars per tonne of carbon abated. Climate change mitigation indicator. This metric will be investigated during the program design stage.	Annual indicator update by Investment Navigator. Data stored on municipal platforms.	Investment System
	19. Successfully fund energy poverty reduction solutions	Funding and investments toward the program	2018-19	$250,000 Smart Cities Challenge finalist grant	2024-25	$45.7 million	Total funding and investments in energy poverty reduction program, including local investments and stacked funding (e.g. grants, rebates, etc.).	Annual indicator update by Investment Navigator. Data stored on municipal platforms.	Investment System
	20. Demonstrate feasibility and effectiveness of program	Achievement of program outcomes	2018-19	No outcomes achieved	2024-25	Phase 3 outcomes achieved, positive evaluation by partners and participants	Achievement of program outcomes, and evaluation by partners and participants. Measured though comprehensive evaluation process for program partners and participants.	Annual indicator update by program managers. Data stored on municipal platforms.	Overall Program
Demonstration of impact	21. Inspire structural energy poverty solutions at the Provincial and Federal levels	Government policies or programs have been influenced by the Energy Poverty Reduction Program model	2018-19	No reported instances yet	2029-30	Increase from baseline	Number of senior government articles of legislation, policies, or programs that have been definitively influenced by the Bridgewater program. Measured through information sharing with Provincial and Federal governments.	Annual indicator update by program managers. Data stored on municipal platforms.	Overall Program
	22. Inspire other communities to adopt energy poverty reduction efforts	Other communities in Canada have been influenced by the Energy Poverty Reduction Program model	2018-19	No reported instances yet	2029-30	Increase from baseline	Number of other communities in Canada that attribute all or part of their energy poverty reduction efforts to the Bridgewater program. Measured through information sharing with other communities.	Annual indicator update by program managers.. Data stored on municipal platforms.	Overall Program

Table 2.10

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GOVERNANCE STRUCTURE

As a municipal service, the Energy Poverty Reduction Program falls under Bridgewater Town Council's oversight, and under management of the Chief Administrative Officer (CAO). Final design and implementation of the program will be the responsibility of the Community Development Department, with a number of related functions taking place through other departments. The following elements are proposed within the governance and management structure:

- **Energy Poverty Reduction Program Steering Committee:** a formal Committee of Council that will provide advice to Council and staff on the design and implementation of the program. The Steering Committee will assist with maintaining community partnerships, and participate in program evaluation and quality review. It will participate, as appropriate, in client dispute resolution through an ombudsperson, and meet periodically with a Client Advisory Circle to receive client feedback. It is envisioned as a 6-10 member group, consisting of key program partners from the local community sector as well as regional organizations with expertise in energy and housing, such as Efficiency Nova Scotia. A member of Town Council will also sit on the Committee. Committee members do not receive compensation for their role through the Town, though some members may be paid staff from other organizations. The Committee will be resourced and supported by Town staff who coordinate and implement the program. A Terms of Reference for the Committee will be developed, and the Committee positions will be filled as one of the earliest activities in Phase 1.

> Collaborating as a group to help solve problems is often much more effective than organizations trying to do it on our own.
> – COMMUNITY SERVICE ORGANIZATION

- **Ombudsperson:** clients whose complaints about the program are not able to be resolved by program management may escalate their complaint to the Ombudsperson. This person is charged with representing the interests of program clients by investigating and addressing complaints. The Ombudsperson is recommended by the Steering Committee, and will be an external, independent expert with knowledge of the program. They will receive compensation for their work on a per diem basis. A role description for the Ombudsperson will be developed during Phase 1.

- **Client Advisory Circle:** prospective, current, and past clients of the program are recruited to participate in this advisory structure to provide periodic feedback to the Steering Committee and the program management team. The Client Advisory Circle is consulted on matters related to program design and implementation, quality, accessibility, affordability, fairness, and overall impact of the program. As the program clients include both households-at-risk as well as property owners, the Client Advisory Circle will represent both. Client Advisory Circle members receive a per diem to cover their participation, to reduce the risk that financial barriers will prevent effective participation. A Terms of Reference for the Client Advisory Circle will be developed as one of the earliest activities in Phase 1.

- **Technical Advisory Circle:** an ad-hoc working group that supports the program management team in the design and implementation of the program. The Technical Advisory Circle provides voluntary, independent, expert advice and project support to Town staff. A Terms of Reference for the Technical Advisory Circle will be developed as one of the earliest activities in Phase 1.

- **Program Coordinator:** the Community Development Department will put its staff

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in charge of the overall coordination of the program. The Energy Poverty Reduction Program Coordinator reports to Senior Manager and through the CAO to Town Council. This staff is also the main resource to the Steering Committee. As this coordination role is critical to all components of the program, the job description(s) for staff will be developed and/or updated, and any necessary hiring completed before Phase 1 begins.

- **Municipal Program Management:** day-to-day management of the 4 linked municipal services (the Housing Energy Management System, Community Energy Systems, the Mobility Improvement System, and the Investment System) will fall to municipal staff. Activities within each program will be a combination of staff effort and procured third-party services. Technical Navigators and an Investment Navigator provide services both to program clients and to program managers, while an Information Systems Specialist provides data management services within the program. Quality control and evaluation is carried out by staff, in partnership with the Steering Committee. Full descriptions of these positions will be developed before Phase 1 begins, and any necessary hiring will commence as one of the earliest activities of Phase 1.

- **The Coordinated Access System** will be managed by a third-party service provider with its own management and governance systems. Household Navigators are employed by the service provider. A partnership or service agreement defines the relationship between the Town and the external organization, as well as the responsibilities of both parties. See the **Performance Measurement Chapter** for a more detailed description of the service procurement process and anticipated timelines.

- **The Financial Investment Vehicle,** a sub-component of the Investment System, will be managed by a third-party service provider with its own management and governance systems. A partnership or service agreement defines the relationship between the Town and the external organization, as well as the responsibilities of both parties.

  See the **Performance Measurement chapter** for a more detailed description of the service procurement process and anticipated timelines.

The relationship between most of the governance and management structures described above are illustrated in the following in Diagram 3.1.



A Bridgewater resident views an exhibit on energy poverty at a Smart Cities Challenge Open House.

> It would help so that we wouldn't have to scurry around, one call request for assistance requires 8 other calls; if we would just network it would make it easier.
>
> – COMMUNITY SERVICE ORGANIZATION

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Program Governance and Management

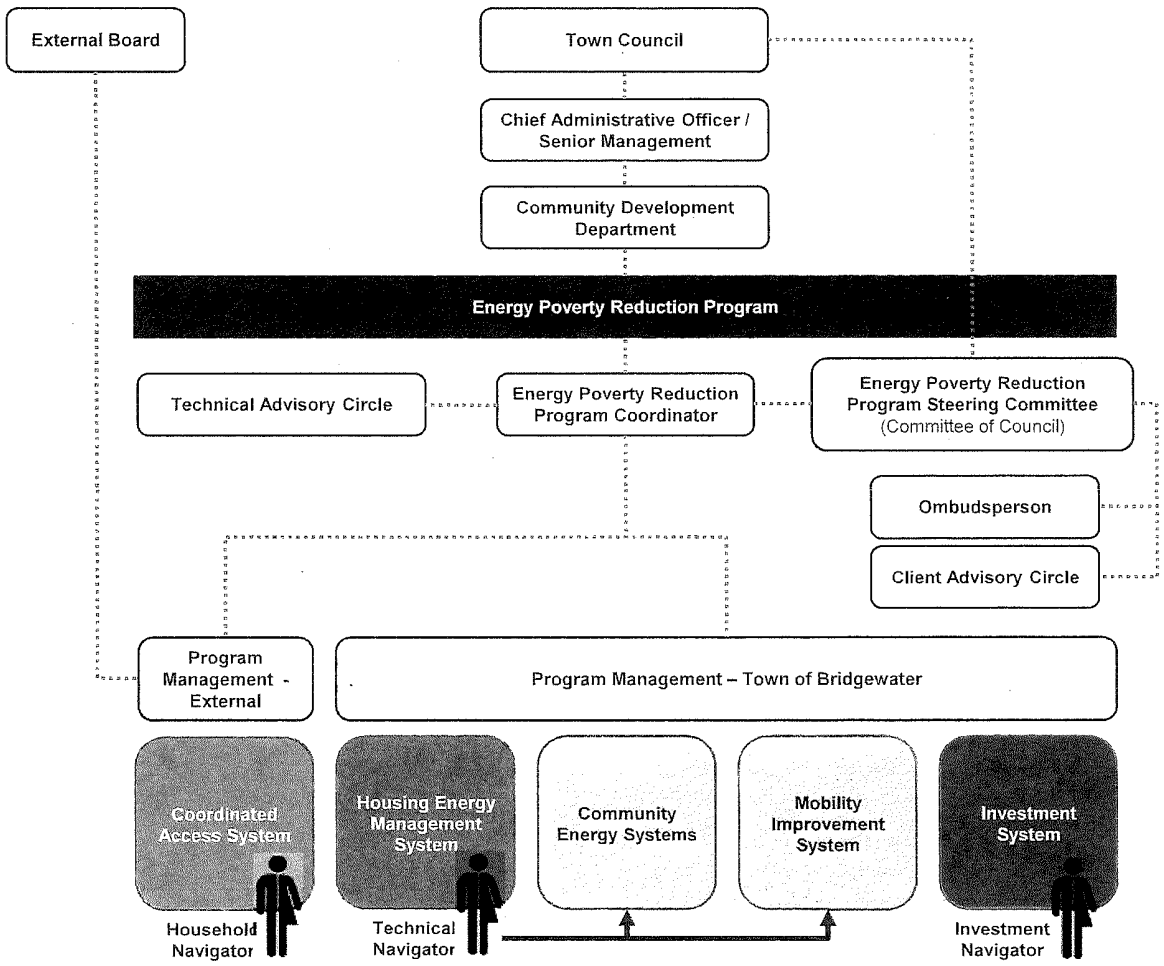


Diagram 3.1

EVALUATION, RISK MANAGEMENT, AND QUALITY CONTROL

Program staff will lead ongoing monitoring and reporting of program outputs as well as outcome indicators throughout all phases of the program. Monitoring and reporting responsibilities are divided by program, as defined in the **Performance Measurement chapter.** Performance measurement for activities that fall under "overall program management" are the primary responsibility of the Energy Poverty Reduction Program Coordinator, with the support of the Steering Committee. Annual reports will be generated for all program services, and shared widely with program stakeholders including Bridgewater Town Council. In its reports, staff will ensure that all identifying personal and business information is reported in aggregate unless express permission is given to share the information publicly.

See the **Engagement chapter** for information on how the program will maintain evaluation engagement with all its stakeholders.

All structures and members within the program governance and management system also have defined roles to play in the program's risk management and quality control processes. While risk management and quality control oversight ultimately rests with Bridgewater Town Council

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and the Chief Administrative Officer, the lead role for ongoing risk management and quality control activities will be delegated to program staff throughout all phases of the program. The risk management framework and quality control processes, including program governance risks, are described in the **Project Management chapter.** These activities will involve all other structures and members on a periodic basis, with additional involvement as needed. Key among these will be the Energy Poverty Reduction Program Steering Committee, which will be kept informed of emerging risk and quality control issues, and consulted on mitigation strategies.

PARTNER COMMITMENTS

We are pleased to report that a large and diverse group of program partners and supportive organizations have pledged their support for Bridgewater's proposed program. Partner commitments are described below, grouped by program service:

HOUSING ENERGY MANAGEMENT SYSTEM AND COMMUNITY ENERGY SYSTEMS

- **Green Power Labs** – Committed to the development and integration of the Energy Management Information System, engineering and integration of the real time operations (RTO) system, general technology development, and support and operations in the Town of Bridgewater up to 2030.
- **Efficiency Nova Scotia** - Committed to partnering on detailed program design and delivery of the Housing Energy Management System. This includes the provision of energy efficiency services and financial incentives for retrofits and new construction. Advisory support is provided through the Energy and Financing Working Group.
- **TownSuite Municipal Software** – Expressed interest in exploring the expansion of existing municipal software with the addition of an energy management information system (EMIS) module, with the eventual expansion into real time operations (RTO) functionality. Supportive of exploring the possibility of the enterprise resource planning (ERP) system backbone to support the program and develop the Client Mobility Application module.
- **Clean Foundation** - Committed to the provision of expertise, service delivery and design for the residential energy efficiency retrofit program. Clean Foundation will share data, and related financial and technical learnings of a recently piloted Net Zero retrofit program in Bridgewater.
- **Nova Scotia Power** - Nova Scotia Power will support access to the AMI and the Green Button initiative, offer financing for heat pumps for home retrofits, and provide support for connected technology solutions and applications, as well as expertise for charging stations for electric public transport.
- **St. Mary's University – Faculty of Science** – Committed to the provision of significant contributions in collaboration with Green Power Labs towards Big Data Management, Data Science, Machine Learning, and other aspects of Artificial Intelligence of the project.
- **Dalhousie University – Faculty of Computer Science** - The Smart City Research initiative of Dalhousie University is committed to partnering with Bridgewater to implement the Energy Poverty Reduction Program by providing advisory support. Advisory support is provided through the Energy and Financing Working Group.
- **Nova Scotia Department of Energy and Mines** – Committed partner on the implementation of the Community Energy Investment Plan and the Energy Poverty Reduction Program. Advisory support is provided through the Energy and Financing Working Group.
- **Affordable Energy Coalition** – Continued efforts to influence provincial policy and programs to further support energy poverty reduction efforts and inspire other communities to adopt Bridgewater's model. Further aid in knowledge sharing on how to best work with landlords in implementing energy retrofits.
- **Housing Nova Scotia** – Committed to exploring a partnership for upgrade

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referrals and continuing to provide up to date information on programs, funding, and housing stock. In addition, exploring a relationship to monitor and reduce the energy consumption of public buildings.

- **Ecology Action Center** – Committed to providing program education, advocacy, and engaging landlords in the proposed retrofit program.
- **Quality Urban Energy System of Tomorrow (QUEST)** – Prepared to disseminate program information to other municipalities through a Municipal Energy Learning Group and the QUEST NS Buildings Working Group. As one of five regional advisors for the Partners for Climate Protection program, QUEST will share replicable aspects of this program widely within the country. Committed to providing advisory support through the Energy and Financing Working Group.

MOBILITY IMPROVEMENT SYSTEM:

- **Nova Scotia Community Transportation Network** – Committed to promoting Bridgewater's transportation model to other rural communities in Nova Scotia and strengthening the network of relationships between non-traditional for-profit and non-profit community-based transportation providers.
- **Bridgewater Active Transportation Advisory Committee** – Committed to advising the town in its efforts to become an active transportation-supportive community, including putting an AT lens on town infrastructure, programs, policy and projects, and increasing partnerships promoting active transportation.

INVESTMENT SYSTEM:

- **New Dawn Enterprises** – Committed to potentially partnering with the Town of Bridgewater to establish a centralized CEDIF platform if it is selected as a community-investment tool. Advisory support is provided through the Energy and Financing Working Group.
- **Energy Services Association of Canada (ESAC)** – Members are committed to engaging in a competitive tendering process to demonstrate innovative ways to work with and be an integral part of Bridgewater's Smart City vision.

COORDINATED ACCESS SYSTEM:

- **Freeman House in association with Family Services of Western Nova Scotia** – Committed to partnering with the Town to administer the Coordinated Access System, provide guidance and support for system setup, on-going operations, communications, and in-kind support through staffing.
- **Nova Scotia Health Authority** – Committed to championing work within their networks and among community members through a Coordinated Access System, working with experts to develop an energy poverty index using health system data, and facilitating collaboration with other NSHA programs.
- **Nova Scotia Community College, Lunenburg Campus** - Committed to providing education and training opportunities through the Work Integrated Learning Programs, partnering with their Women Unlimited program to help showcase women in non-traditional trades and technology workplaces, integrating into a Coordinated Access System, and ultimately exploring the creation of new programming opportunities in the areas around Green Energy and Technologies.
- **South Shore Housing Action Coalition** - Prepared to support the program in an advisory capacity, engage its broad spectrum of members, and to support and facilitate the sharing of information about the project.
- **Service partners** committed to continued project engagement for the planning of a measurable, manageable and effective Coordinated Access System, and acting as referral and outreach agents, in the promotion, enhancing, and navigation of community resources through the system. These partners include: **Society St. Vincent de Paul; The Ark and Support Services Group;**

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Second Story Women's Center; Lunenburg County YMCA; United Way Lunenburg County; Salvation Army Bridgewater, N.S; South Shore Family Resource Center; Big Brothers, Big Sisters of South Shore; Be the Peace Institute; Bridgewater and Area Lions Club; Bridgewater Law Office (Nova Scotia Legal Aid); Nova Scotia Works; Bridgewater Food Bank; Family Support Center; Souls Harbour Rescue Mission, Bridgewater; SchoolsPlus; Small World Learning Center.

OVERALL PROGRAM SUPPORT

- **Halifax Regional Municipality –** Committed to sharing information on climate change related initiatives.
- **Government of Nova Scotia –** Committed to supporting the Town as a climate change leader.

Letters of support confirming all these commitments are provided in the Appendix. Additional letters of support that are confidential in nature because they contain sensitive market information are provided in the Confidential Annex.

DATA AND INFORMATION GOVERNANCE

Data and related infrastructure, along with the technologies and services for the Energy Poverty Reduction Program are key to the success, transferability and replicability of the program. Data governance must ensure that digital solutions both improve the liveability and wellbeing of the households-at-risk of energy poverty, and also meet democratic, privacy, and quality standards appropriate for a project of this scale.

At the core of municipal data governance lies the question of what communities can do in order to manage data in the best interest of their community members and the stakeholders at large without jeopardising privacy and security, and the potential business opportunities that lie within municipal data sets. This eventually leads to a fundamentally new form of public-private partnerships with data as the instrument. In developing this Energy Poverty Reduction Program, we have begun to develop a data governance policy which will need further refinement in the early stages of the program development. This needs to be undertaken in conjunction with the technology and data platform development process. This is discussed in further detail in the **Data and Privacy chapter.**

To develop a strong municipal data governance system for our Energy Poverty Reduction Program, the Town will be carefully considering the following questions and working with our community partners and participants to determine how we will manage the great deal of data and information sharing that is inherent in a smart cities approach.

- What strategies and approaches do communities need to follow to enable third-parties to share their data with the Town of Bridgewater?
- How can the Town remain the decision maker about data usage in public-private partnerships or in data-driven projects that impact the common good?
- What are the lines of decision making and how can the Town create transparent systems that show the existing trade-offs between public and private interests?
- What resources and skills are needed in Bridgewater to moderate data-related decision making?
- How can communities successfully initiate and steer pilot projects on municipal data?
- How do communities ensure ownership of the data in public contracts?
- What data should be provided as open data by the Town and how can communities arrive at a decision about this?
- How can communities embed their policy requirements in municipal data platforms?

The **Data and Privacy chapter** provides preliminary responses to the above questions. Additional work needs to be done during the detailed program design process to fully develop the Energy Poverty Reduction Program data governance framework. Concerns about data are detailed in the risk management section in the **Project Management chapter.**

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COMMITMENT TO INNOVATION AND ENERGY POVERTY REDUCTION

Over the past decade, the Town has been an active partner in multi-sectoral initiatives around topics as diverse and complex as food security, affordable housing, youth retention, health services planning, seniors safety, transportation, gender-based violence prevention, alcohol harm reduction, economic development, and a variety of community development initiatives.

The implementation of our ground-breaking Community Energy Investment Plan (2018) remains Town Council's key area of focus, and holds a priority status in the Town's Economic Development Action Plan (2018). The Town has publicly affirmed its commitment to implementing a broad spectrum approach to energy transition and energy poverty alleviation, including the new and innovative solutions that participation in the Smart Cities Challenge has helped us to identify and design.

PROJECT MANAGEMENT CAPABILITY

The Town of Bridgewater has worked hard to expand its highly qualified staff team to the point where it can confidently manage the detailed design and set up of the Energy Poverty Reduction Program. Initial lead staff on this file will include:

- Tammy (Crowder) Wilson, CAO. Tammy has over 20 years' experience in municipal government. She has worked on energy projects including wind energy and anaerobic digestion projects under the Nova Scotia's COMFIT program. She has also facilitated a partnership with the private sector to see landfill material turned into a marketable commodity and increase landfill diversion. Tammy has led the regionalization of some municipal services along the south shore, including participating in the development of several municipal corporations.
- Jessica McDonald, Director of Community Development. Jessica spent over a decade coordinating multi-sectoral environmental policy initiatives and programs for the Province of Nova Scotia. In Bridgewater, her accomplishments include stewarding the design and implementation of the Town's ambitious Pijinuiskaq Park and King Street streetscape enhancements, and overseeing the development of its first fixed route public transit service.
- Leon de Vreede, Sustainability Planner. Leon has managed the Town's sustainability program for over 10 years. Specializing in innovative planning, program design, and community engagement practices, Leon's work has been recognized by the Province of Nova Scotia through an inaugural Clean Climate Leader award in 2015, and by the Federation of Canadian Municipalities through his designation as a PCP Local Climate Change Hero in 2016. Leon will function as Program Coordinator for the proposed program.
- Greg Goubko, Energy Finance & Development Coordinator. Greg has spent the past 4 years working at the Toronto Renewable Energy Co-op/Tapestry Community Capital as the Community Investment Manager. He has recently joined the Town of Bridgewater to help with the implementation of the Community Energy Investment Plan and the Smart Cities Challenge project. He brings a wealth of knowledge related to community financing and local investment.
- Myles Cornish, On-Site Energy Manager. Myles is a Professional Engineer, working for Bridgewater under contract for Efficiency Nova Scotia. Aided by his extensive network throughout the Efficiency Nova Scotia organization as well as to external trade partners, Myles brings the core engineering expertise to the table that is needed to design and implement the infrastructure solutions proposed by the program.

Project management decisions will be made by the Director of Community Development and the CAO, and key decisions that affect town services (e.g. selection of technology partners, and key program design considerations) will be brought to Council for direction. The Steering Committee

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will review all project documentation (including staff-generated reports, RFPs and Terms of Reference, and consultant and legal reports) and provide feedback and guidance to staff throughout the process.

PROGRAM DEPLOYMENT

Lifting our residents out of energy poverty is an ambitious outcome outcome, which will many activities and deliverables along the way. A detailed discussion of the program activities and outputs (deliverables) are contained in the **Performance Management chapter** and includes a comprehensive list of indicators to help us measure and monitor our progress. Resource assessment for each element of the Energy Poverty Reduction Program is also discussed in that chapter. This includes details on program design, staffing, technology, partner and stakeholder engagement, procurement processes and needs, legislative and regulatory approvals, database and technology needs, administration, communications and evaluation. Costs associated with each program area, including the proposed use of the Finalist Grant, is provided in the **Financial chapter,** Tables 9.1 through 9.14. Strategies for engagement with partners, stakeholders, and target clients for the program are discussed in the **Engagement chapter.** This includes strategies for ensuring that our program is designed to be meaningful, fair and impactful for the broad range of residents who find themselves struggling to pay their energy bills in the face of all the other household priorities and hurdles.

The Energy Poverty Reduction Program consists of a set of 5 interconnected systems that will be deployed in 4 phases; each building off each other with some overlap in the early phases.

1. **Prototype Program Setup -** This phase includes partnership development; detailed service and technical design; service procurement; client consultation; a comprehensive Privacy Impact Assessment (PIA) on the detailed program design and an overarching privacy policy.

2. **Prototype Program Testing & Refinement -** This phase involves a gradual ramping up of client intake; continuing design and implementation of services and technologies; and monitoring and evaluation of results. Program outcomes become measurable by end of this phase.

3. **Final Program Activation -** This phase requires the finalization of program service design and technical components; extensive documentation of program outcomes; and the development of learning materials for other communities and senior governments. The completion of the Final Program Activation phase marks the end of Smart Cities Challenge contribution agreement.

4. **Program Maturity -** This phase includes ongoing client intake; program evaluation and improvement as well as the integration of new and emerging community energy technologies and solutions.

Program Deployment Phases and Households Served by Program Year

Program Year	2020-21	2021-22	2022-23	2023-24	2024-25	Total
Phase	1: Prototype Program Setup					
		2: Prototype Program Testing & Refinement				
				3: Final Program Activation		
						4.Program Maturity
Households Served	0	50	75	100	125	750 over 5 years
Relationship to Smart Cities Challenge (SCC)	Within SCC Program & Funding					After SCC

Table 4.1

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> When people are in a crisis, they need manageable steps to be able to navigate the system of services.
> – RESIDENT, TOWN OF BRIDGEWATER

Table 4.1 describes the timing of phases and the number of households served. As stated early on in the project overview, households-at-risk are less likely to also be the property owner. So the number of households served will account for both the inhabitants and the property owners of the properties they inhabit.

The extended period of prototyping, evaluation and improvement ranging from fiscal year 2021-22 to 2024-25 has been purposefully planned in recognition of the complexity of the program and the need for frequent review and adjustment of goals and solutions. This approach to prototyping is in line with smart cities approaches that revolve around continuous learning and feedback cycles using program metrics and client and partner evaluation.

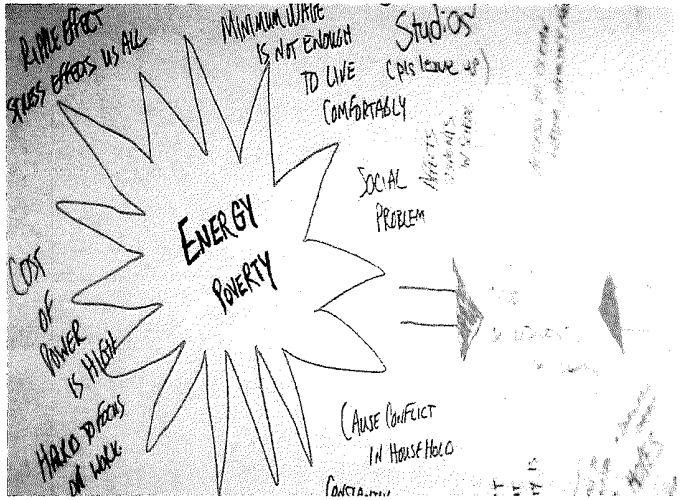
This approach has also been selected to support a robust risk management process that will ensure program risks and challenges arising from program activities, outputs, and outcomes are mitigated in real time and that emerging risks are being identified before they create problems. In particular, 4 key program risks will be continuously assessed and mitigated through this phased deployment:

- Program uptake risk: uncertainty as to the willingness of households-at-risk and property owners to participate in the program
- Financial risk: uncertainty in program costs and sources of funding and investment
- Technical risk: uncertainty in database development timeframes and functionality
- Supply chain risk: uncertainty in the availability of skilled labour to complete the envisioned infrastructure improvements

The project risks and mitigation strategies are comprehensively discussed in the next section of this chapter.

Risk Management Framework

Project risks and their respective mitigation strategies related to all other chapters in this application are fully described in this section. As described in the **Performance Measurement chapter,** the Energy Poverty Reduction Program will measure the progress toward its outputs and outcomes through an iterative process of design, prototyping, and evaluation. This approach will ensure that program risks and challenges arising from program activities, outputs, and outcomes are being mitigated in real time. It also supports the program's governance, evaluation, and quality control needs.



Notes from a discussion at a Smart Cities Challenge workshop.

Connecting these elements is the program's risk management framework, which consists of the following components:

- an analysis of program risks
- a set of overarching risk management strategies
- a series of course correction checkpoints and risk mitigation options for the program

ANALYSIS OF PROGRAM RISKS

Table 4.2 identifies significant program risks based on the theme of specific chapters within this application, as well for the overall program. Risk probability and risk impact are both measured on a relative scale of 1 (low), 2 (moderate), and 3 (high).

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Risk Assessment by Program

Risk Category	Risk	*Risk Probability	*Risk Impact	Description of Impact	Risk Summary	Monitoring & Reporting on this Risk
Overall Program	Smart Cities Challenge grant not achieved	3	3	Lack of funding for program development. Program unlikely to be implemented as proposed, and/or over much longer timeframe.	Significant risk, not easily mitigated	Proposal evaluation by Jury
	Substantial economic downturn affects overall ability to secure financing & funding	1	3	Lack of program funding. Program may need to be implemented over much longer timeframe.	Significant but unlikely risk, partially mitigatable	Investment System
	Program fails to lift residents out of energy poverty, or affect systemic change as envisioned	2	3	Affects program targets, performance measures, and ability to meet outcomes.	Significant risk, partially mitigable	Overall Program Management
	Program is too complex for clients, partners, and service providers to navigate or maintain	2	2	Affects ability of clients/partners/service providers to navigate program structures and processes. Reduces client, partner, and service provider participation rate. Delays program implementation. Adds to program cost. Affects program targets, performance measures, and ability to meet outcomes.	Moderate risk, partially mitigatable	All program services
Performance Measurement	Performance indicators cannot be measured as expected	2	1	Affects performance measurement and outcomes monitoring.	Minor and mitigatable risk	All program services
	Actual energy poverty rate is different than currently understood (38.5%)	2	2	Affects program targets, performance measures, and ability to meet outcomes. May not be able to be measured accurately.	Moderate but mitigatable risk	Overall Program Management
Governance	There is insufficient capacity/interest by program partners to maintain effective program governance & evaluation	1	2	Program implementation responsibility rests too heavily on Town of Bridgewater. Community champions lacking. Reduced program uptake. Reduced program quality.	Moderate but unlikely risk	Overall Program Management
	Client or partner makes complaint that is unable to be resolved	2	2	Additional strain on program resources & management. May escalate into legal or regulatory action against program. Affects public perception of program.	Moderate but mitigatable risk	All program services and Ombudsperson
Project Management	Contractor & supply chain capacity is lower than anticipated	3	3	Delays program implementation. May affect program quality. Likely to increase program costs.	Significant risk, not easily mitigated	Housing Energy Management System, Community Energy Systems, and Mobility Improvement System
	Key service delivery partner defaults on contract or experiences loss in capacity to carry out responsibilities	1	3	Delays program implementation. May affect program quality. May increase program costs. May lead to client/partner dissatisfaction as a result of interrupted service.	Significant but unlikely risk, partially mitigatable	All program services
	Regulatory, cost, and project management uncertainty in deployment of development and financing structures	3	2	Program design cannot be finalized until development and financing structures are confirmed. Affects cost and project management assumptions, as well as procurement and partnership design. Creates overall program uncertainty. Lack of resolution within reasonable timeframe affects program targets, performance measures, and ability to meet outcomes.	Moderate risk, partially mitigatable	Investment System and Community Energy Systems

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Risk Category	Risk	*Risk Probability	*Risk Impact	Description of Impact	Risk Summary	Monitoring & Reporting on this Risk
Project Management	Challenges finding or retaining qualified staff to manage the program	1	2	May delay program implementation or affect program continuity. May affect program quality. May increase program costs. May lead to client/partner dissatisfaction as a result of interrupted service.	Moderate but unlikely risk	All program services
Technology	Legislative & regulatory barriers prevent deployment of community energy solutions or delay their deployment	2	2	Delays project implementation. Affects program targets, performance measures, and ability to meet outcomes. May result in energy affordability and security goals not being met.	Moderate risk, partially mitigatable	Community Energy Systems
	Technical assessment/due diligence studies of community energy systems yield unfavorable results or take longer than anticipated	2	2	Delays project implementation. Affects program targets, performance measures, and ability to meet outcomes. May result in energy affordability security goals not being met.	Moderate but mitigatable risk	Community Energy Systems
	Development of core data platform solutions is more technically complex, costly, or time-consuming than anticipated. Scope creep.	2	3	Delays program implementation. May affect program quality. Likely to increase program costs.	Significant risk, not easily mitigated	All program services
	Anticipated data platform partners not interested in participating	2	2	Delays program implementation. May affect program quality. Likely to increase program costs. May result in interoperability challenges.	Moderate risk, partially mitigatable	All program services
	Technological disruption causes dramatic change in cost or ability to implement planned technological solutions	1	2	Effects generally unknown - may enhance or hinder program implementation, including costs and ability to meet outcomes.	Moderate but unlikely risk	All program services
Data and Privacy	A data security breach occurs in one or more data platforms	1	3	May compromise client and partner data, including personal and corporate information. May result in program shutting down operations to address security breach. May erode trust in the program and affect the program's ability to attract clients and service providers, affecting program outcomes.	Significant but unlikely risk, partially mitigatable	All program services
	Program participants' concerns about privacy are not satisfied, leading to low uptake rates/negative publicity	1	2	May affect the program's ability to attract clients and service providers, affecting program outcomes.	Moderate but mitigatable risk	All program services and Ombudsperson
	Program partners are unable or unwilling to share all or part of anticipated data	2	2	May affect program's ability to track clients, partners, and outcomes indicators. May affect program quality.	Moderate risk, not easily mitigated	All program services
	A data platform experiences a service delivery problem or unexpected failure	1	3	May result in program shutting down operations temporarily. May erode trust in the program and affect the program's ability to attract clients and service providers, affecting program outcomes. May affect program quality. May increase program costs. May lead to client/partner dissatisfaction as a result of interrupted service.	Significant but unlikely risk, partially mitigatable	All program services
Engagement	Program delays or challenges result in negative publicity in community and beyond	1	2	May affect the program's ability to attract clients and service providers, affecting program outcomes.	Moderate but mitigatable risk	All program services

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Risk Category	Risk	*Risk Probability	*Risk Impact	Description of Impact	Risk Summary	Monitoring & Reporting on this Risk
Engagement	Program is ineffective at reaching clients who are most in need	2	2	Program outcomes not achieved. Energy poverty rate not reduced as quickly as anticipated. Negative publicity may affect the program's ability to attract clients and service providers, further affecting program outcomes.	Moderate risk, partially mitigatable	Housing Energy Management System and Coordinated Access System
	Program uptake (households-at-risk) is lower than anticipated	1	2	Program outcomes not achieved. Service contract thresholds not reached. Energy poverty rate not reduced as quickly as anticipated.	Moderate but unlikely risk	Coordinated Access System
	Program uptake (property owners) is lower than anticipated	2	3	Program outcomes not achieved. Service contract thresholds not reached. Energy poverty rate not reduced as quickly as anticipated.	Significant risk, not easily mitigated	Housing Energy Management System
	Program uptake in general is higher than anticipated	2	2	Additional strain on program resources and management. Dissatisfaction in community if waiting list grows.	Moderate but mitigatable risk	Housing Energy Management System and Coordinated Access System
Financial	Legislative & regulatory requirements are not met or delayed, including expectations around regulatory changes	2	2	Delays project implementation. Affects program targets, performance measures, and ability to meet outcomes. May result in energy affordability and security goals not being met.	Moderate risk, partially mitigatable	All program services
	Major regulatory change causes disruption to program	1	2	Effects generally unknown - may enhance or hinder program implementation, including costs and ability to meet outcomes.	Moderate but unlikely risk	All program services
	Program costs are higher than anticipated. May arise from currency risk	2	3	May make housing, transportation, and community energy system improvements unattainable or only partially attainable. Increases demands on funding / financing. Delays program implementation. May affect program quality.	Significant risk, partially mitigable	All program services
	Funding from financial investors lower than anticipated	2	3	May make ROI components of program unattainable or only partially attainable. Increases demands on non-investor funding. Delays program implementation. May affect program quality.	Significant risk, not easily mitigated	Investment System
	Funding from social investors (government, foundations) lower than anticipated	2	3	May make non-ROI components of program unattainable or only partially attainable. Increases demands on debt financing. Delays program implementation. May affect program quality.	Significant risk, not easily mitigated	Investment System
	Home energy savings are lower than anticipated as result of inaccurate estimates	1	3	Affects cashflow of property owners and possibly tenants. May not achieve poverty reduction outcomes. May make poverty issues worse. Negative client experience. Affects public perception of program.	Significant but unlikely risk, partially mitigatable	Housing Energy Management System
	Home energy savings are lower than anticipated as result of insufficient funding	2	2	Affects cashflow of property owners and possibly tenants. May not achieve poverty reduction outcomes. Affects public perception of program.	Moderate risk, not easily mitigated	Housing Energy Management System
	Home energy savings are lower than anticipated as result of conventional energy prices being lower than anticipated	1	2	Affects cashflow of property owners and possibly tenants. May not achieve poverty reduction outcomes. May make poverty issues worse. Negative client experience. Affects public perception of program.	Moderate but mitigatable risk	Housing Energy Management System

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Risk Category	Risk	*Risk Probability	*Risk Impact	Description of Impact	Risk Summary	Monitoring & Reporting on this Risk
Implementation Phase Requirements	Collaboration with First Nations communities is less robust than expected	2	1	Missed opportunity for reconciliation, partnership, economic development, and cultural exchange.	Minor risk, not easily mitigated	All program services
	Diversity targets not met for recruitment, training, and procurement as per Community Employment Benefit (CEB) reporting	2	1	Inequitable distribution of community economic benefits. Missed opportunity to build program strength by learning from disaffected segments of the community.	Minor and mitigatable risk	All program services
	Legislative & regulatory requirements are not met or delayed, including expectations around regulatory changes	2	2	Delays project implementation. Affects program targets, performance measures, and ability to meet outcomes. May result in energy affordability & security goals not being met.	Moderate risk, partially mitigatable	All program services
	Major regulatory change causes disruption to program	1	2	Effects generally unknown - may enhance or hinder program implementation, including costs and ability to meet outcomes.	Moderate but unlikely risk	All program services

Table 4.2

RISK MANAGEMENT STRATEGY 1: ESTABLISH CORE RISK MANAGEMENT STRUCTURES & PROCESSES

During the first year of the program (fiscal year 2020-21) a set of 7 program structures and processes will be put in place to establish an overall risk management process.

- Governance Structure & Commitments: establish an effective program governance structure as described in the **Governance chapter.** Effective risk management across all risk areas begins with strong governance. Effective governance requires long-term commitments from key program partners as they participate in key roles on the Energy Poverty Reduction Program Steering Committee.
- **Management Structure & Capacity:** establish an effective program management team with the capacity to implement the program, as described in the **Governance chapter** and earlier in this chapter. Qualified staff working under diligent oversight by Bridgewater Town Council and the Chief Administrative Officer will ensure that a broad range of program risks are minimized by having outputs achieved effectively and on budget. Management relationships with external organizations, in particular for the Coordinated Access System and the Financial Investment Vehicle, will reduce program risk through strong service contracts and/or partnership agreements, with responsibilities, deliverables, and timelines clearly defined.
- **Evaluation Process:** Phase 1 of the program will start with the program evaluation process already active, so that the process can support the program setup work from the very beginning, allowing staff and program partners to identify, communicate, and manage any and all program risks as they emerge. Effective and timely performance tracking mitigates risk through the early identification of areas where program deliverables are falling short or experience implementation delays, allowing for course corrections. Year 1 of this process will also involve the review of program indicators so that adjustments can be made to performance measurement methodologies and targets. The evaluation process and the program outputs and

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outcomes it will measure are described in the **Performance Measurement chapter.**

- **Communications System:** ensuring timely and effective communications between program governance, program management, program partners, and program clients mitigates program risk by reducing opportunities for misunderstanding, speeding up processes, and maintaining cohesion across the multiple service areas. Detailed communications strategies will be developed for program services with high community engagement and marketing needs. Program communication will ensure cautious and transparent communication with residents on their rights related to sharing data, who will be able to see their data, and how it will be stored. Strong communication regarding the confidentiality of participants' sensitive information will be ensured to maintain trust with participants and ensure that at-risk, and vulnerable populations are insulated from potential risks for sharing sensitive information when accessing services. Program communications are the responsibility of all program managers, and are overseen by the Program Coordinator.

- **Quality Control / Quality Assurance Process:** The system to maintain the standards of the Energy Poverty Reduction Program consist of a three-level hierarchy of controls. The first level, and closest to the client, consists of an Ombudsperson and a Client Advisory Circle. These roles relate to communicating client experiences directly to the program governance and management teams, and resolving client complaints, program quality concerns, and program impact deficiencies. They are further described in the **Governance chapter.** If quality control has not been assured via the first-level supports, then issues can escalate to the Program Steering Committee where authority to make program decisions to ensure ongoing quality will be granted in the Terms of Reference. If quality control concerns exist after this second-level support, concerns can be directly expressed to the Town Council, who maintains the ultimate authority over all municipal programs.

- **System Gap Analysis Review Process:** Through the evaluation framework, emergent risks are continuously monitored across all program areas. Among these, a key risk relates to a lack of program accessibility. This is mitigated by continuously asking about whether client and stakeholder needs are being met, or whether people are 'falling through the cracks' as a result of system gaps. System gaps are also mitigated through regular contact with the Client Advisory Circle, which provides a direct channel for program clients to communicate unmet needs.

- **Privacy Review Process:** To ensure all privacy related precautions are met and data and privacy breaches are mitigated, the entire program will be evaluated from a privacy perspective through the completion of a comprehensive PIA coupled with an overarching Privacy Policy. To ensure both documents are adequate and adhere to standard privacy practices the Town will consult with privacy experts throughout the first year of the program and for all aspects of the program design.

These structures and processes will be designed, implemented and evaluated by the program management team as part of the delivery of outputs related to Overall Program Management. Major risk management checkpoints for this strategy are 6 months into year 1 (October 2020), and 11 months into year 1 (February 2021). These timeframes allow critical course corrections to be made through the risk mitigation options available at each stage (see below).

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RISK MANAGEMENT STRATEGY 2: CONFIRM FEASIBILITY OF PROGRAM

Each program service will undergo a detailed feasibility reviews 6 months before the end of Phase 1 (October 2021), and 6 months before the end of Phase 2 (October 2023), so that overall program feasibility can be assured by Phase 3 (Final Program Activation). Completing feasibility checks, and making any necessary course corrections, also helps ensure that Phase 1 and Phase 2 outputs can be achieved on time. As a risk mitigation strategy, feasibility will be assessed based on 9 areas of program performance.

These feasibility assessments will be completed by the program management team, and will allow critical course corrections to be made through the mitigation options available at each stage (see Table 4.2).

RISK MANAGEMENT STRATEGY 3: ESTABLISH CONTINUOUS MONITORING & IMPROVEMENT SYSTEM

Following the successful completion of Phases 1 and 2, risks related to program feasibility will have been assessed and mitigated, and the program will transition through Final Program Activation (Phase 3) into Program Maturity (Phase 4). This transition will require an amended risk management strategy, which is to deliver these risk management functions through a system of continuous monitoring and improvement.

Program Feasibility Assessment and Criteria

Feasibility Assessment	Feasibility Assessment Criteria
Client Participation	• Client participation rates are sufficient to meet program objectives and performance measures • The program sufficiently meets client satisfaction and needs • The program is sufficiently accessible to intended clients
Service Costs	• Current and future service costs are sufficiently known to enable service delivery planning and contracts • Service costs are within tolerable thresholds to meet program objectives and performance measures
Service Capitalization	• Current and future revenue sources are sufficiently known to enable service delivery planning and contracts • Revenue sources are within tolerable thresholds to meet program objectives and performance measures • The program sufficiently meets funder and investor satisfaction and needs
Data Availability	• Data governance processes and agreements meet partners' and clients' needs • Sufficient data is available to enable service delivery planning and contracts • Key partners and service organizations are able to share sufficient data to meet program objectives and performance measures
Data Platform Setup	• Data platforms have the minimum functionality required to achieve program objectives and performance measures • Data platforms have sufficient oversight, quality control, and security in place to meet partners' and clients' needs
Technical Solutions	• Energy management solutions are sufficiently known to enable service delivery planning and contracts • Performance of energy management solutions is sufficiently measurable to meet program objectives • Energy management solutions are sufficient to meet program objectives and performance measures • Energy management solutions sufficiently meet client satisfaction and needs
Supply Chain & Procurement	• Procurement processes for program services and products results in adequate value and contractual security to meet program objectives and performance measures • Program service providers and product suppliers have sufficient capacity to meet program objectives and performance measures over the long term • Procured services and products meet partners' and clients' needs
Regulatory Limitations	• Current and future legislation and regulations are sufficiently known to enable service delivery planning and contracts • Legislation and regulations enable program services to meet program objectives and performance measures
Program Impact	• Program outcomes and indicators are sufficiently measurable to understand program impact • Program outcomes are achieved • Program impact is defined holistically, and current and emerging gaps in program impact are reevaluated on a regular basis

Table 4.3

This system will be designed in full during Phase 3, and will likely retain a number of risk management, quality control, and performance measurement elements from Phases 1 and 2, as well as additional elements to address emerging risk issues. The continuous monitoring and improvement system will be carried out by the program management team, and will work in

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conjunction with the core risk management structures & processes defined in the first risk management strategy.

PROGRAM COURSE CORRECTION CHECKPOINTS AND RISK MITIGATION OPTIONS

The primary program course correction checkpoints discussed above allow the program management team to implement risk mitigations to improve service design and delivery should the program experience feasibility challenges or fall short on its performance expectations. Depending on the severity of risks identified through risk management and quality control activities, mitigation options may include the following:

- **Change program outputs** – revising program activities and deliverables may address a wide variety of risk, quality, and performance needs.

- **Reduce data platform functionality** – as a major source of program risk, the cost and technical complexity of the data platform may be need to scaled back in scope in order to achieve a minimum viable product (MVP) that is manageable while still achieving program outcomes.

- **Change performance indicators** – altering indicators may more effectively or more practically measure progress toward program outcomes.

- **Change partners** – program partners and service providers may be unable to achieve program deliverables, share data, or participate as meaningfully as originally intended. Finding new partners may allow the program to better meet its outcomes.

- **Increase supply chain capacity** – a major source of program risk, service provider and product supplier capacity may be insufficient to meet the significant needs of the program. Issuing stable long-term contracts, requiring capacity building activities as part of contracts, collaborating with regional trade networks and training programs, and advocating for government policies that increase trade sector capacity may all be necessary to bolster the quality and capacity of program suppliers and service providers.

- **Improve communications** – as insufficient client uptake is a major program risk, altering communication strategies may be required. Improved communications may also be necessary to attract greater interest from funders and investors.

- **Increase funding** – as a town with a very limited ability to draw additional resources from its tax base, Bridgewater lacks the means to put substantial program dollars on the table should funding levels be insufficient to meet program needs. Should program revisions described above yield insufficient risk reduction or quality improvement, or fail to build the necessary program capacity, additional funding sources may be needed to achieve program outcomes. This may result in program implementation delays.

- **Lobby for regulatory change** – municipalities are created and regulated by legislation. If any regulatory impediments or barriers are discovered, we may need to lobby to the provincial and federal governments for change, which can take time and may lead to delays in program delivery and or achievements.

- **Change outcomes** – as a last resort, program outcomes may need to be shifted to become more manageable, or abandoned altogether, if other mitigation options cannot allow the program to achieve the outcomes while also resolving program risks and quality issues.

Table 4.4 provides a preliminary assessment of the risk mitigation options that may address program risk and quality concerns at key course correction checkpoints.

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Program Feasibility Assessment and Criteria

Risk Management Strategy		Course Correction Checkpoint(s)	Risk Mitigation Options								
			change program outputs	reduce data platform functionality	change indicators	change partners	increase supply chain capacity	improve communications	increase funding	lobby for regulatory change	change outcomes
Establish Core Risk Management Structures & Processes	Governance Structure & Commitments	October 2020 and February 2021				x					
	Management Structure & Capacity		x	x					x		x
	Evaluation Process		x		x						
	Communications System		x								
	Quality Control / Quality Assurance Process		x								
	System Gap Analysis Review Process		x		x	x	x	x	x	x	x
Confirm Feasibility of Program	Client Participation	October 2021 and October 2023	x					x	x		x
	Service Costs		x	x			x		x		x
	Service Capitalization		x					x	x		x
	Data Availability				x	x				x	
	Data Platform Setup		x	x					x		x
	Technical Solutions		x								x
	Supply Chain & Procurement		x				x				x
	Regulatory Limitations		x							x	x
	Program Impact		x		x				x		x
Establish Continuous Monitoring & Improvement System		To be determined	x	x	x	x	x	x	x	x	x

Table 4.4

Project Continuation After Smart Cities Challenge

Continuation After Smart Cities Challenge

Smart Cities funding will create the prototype for the Energy Poverty Reduction Program and will ultimately demonstrate the feasibility and value of this initiative continuing over the long term.

Our dedication to energy poverty reduction is evidenced in the **Performance Measurement** and **Financial chapters,** where program considerations for years 6 through 10 are described. Commitment for Town Council's ongoing role in Bridgewater's energy future was proclaimed on January 8, 2018 with the formal adoption of the 32-year Community Energy Investment Plan.

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ENERGY POVERTY REDUCTION THROUGH CONNECTED TECHNOLOGY PLATFORMS

From streamlining client intake, to enriching investment tools, to improving energy flows, connected technology plays a crucial role in all aspects of the Energy Poverty Reduction Program. A central feature of the program design is to empower households-at-risk by providing them with control over their home energy options through building upgrades that measure and monitor usage so that they can actively manage and control their energy costs.

Emerging connected technologies for household energy management built on the internet of things (IoT), big data and intelligent energy management systems are fundamentally changing the practices of households and their daily, monthly and annual energy budgets.

Evidence suggests that energy security is a significant stress factor for households-at-risk. There are cascading negative effects of missing payments on energy bills that result in financial impacts critically affecting all aspects of household life. The ability to optimize energy supply and consumption and to deliver energy reserves such as stored electrical power on demand, particularly in emergency situations, is an emerging requirement directly attributable to connected "smart" technologies and distributed energy resources.

Such technology includes smart thermostats for residential houses and smart thermal optimization for multiunit residential and municipal buildings as well as connected clean technology solutions for energy generation such as residential microgrids, virtual community loads and power plants and electricity micro market management.

At a high-level, this connected technology solution is based on three energy management "pillars" that are interoperable with one another and are all housed within an **energy resource planning platform:**

- An advanced **enterprise resource planning (ERP) system** for municipalities to ensure their housing and mobility assets are integrated with existing applications to support the households-at-risk in the community and will rely heavily on the diligent use and interoperability with the Energy Management Information System (EMIS) and Real Time Operations (RTO) system.

- an **energy management information system (EMIS)** focusing on housing energy management and community energy systems and solutions that will enable energy data monitoring and analytics. The EMIS will operationalize the efficiency of foundational and advanced applications related to energy productivity for the households-at-risk, and broader municipal energy efficiency programs. The EMIS is fully connected to the ERP system to ensure fluidity of information without compromising accuracy.

- a **real time operations (RTO) system,** enabled through supervisory control and data acquisition (SCADA) and energy management system (EMS) solutions, that will leverage the value of the program assets and coordinate its controls in real time. The RTO system is a crucial component to minimizing energy use and maximizing efficiencies, and represents the final stage of the energy resource planning platform development once the municipal ERP system and EMIS are deployed and in operation.

These pillars will enhance the experience of households, sustain optimal levels of performance and reduce the costs of household energy use. The coordinated connected technology solutions focused on the buildings where households-at-risk live will make their homes highly efficient, more comfortable, healthier places to live. In addition to direct benefits, households will be empowered by having greater control of their energy use while encouraging household interactions and knowledge sharing.

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ENTERPRISE RESOURCE PLANNING (ERP) SYSTEM

Enterprise resource planning (ERP) systems are packaged application software suites that support the common business processes, functions and data for the systems of record in an enterprise. The ERP is the system of record - the authoritative source of data that any stakeholder in an enterprise can reference to support their activities. The ERP achieves this by enabling the flow of information across the organization, in end-to-end business processes, through a comprehensive set of interconnected systems modules. Modules can be utilized in different combinations, presenting unique ERP options to meet different administrative, management, operational, analysis and reporting needs. This element of the data platform can be replicated and scaled according to local conditions.

Bridgewater's existing municipal ERP is TownSuite Municipal Software. The platform is used for finance, asset management, land management, human resources, eBilling, and customer service functions. This modified data platform would house the three pillar systems and will be operated in connection with the external Coordinated Access System data platform (HIFIS) as well as an external Financial Investment Vehicle dealing with traditional and community investors. An early conceptual diagram of the integration of the municipal ERP, EMIS, and RTO functionality is provided in Diagram 6.1.

Dialogue with Townsuite has suggested that the Energy Poverty Reduction Program can be built onto this ERP but a full assessment of functionality options, development requirements, and timelines is needed to establish an agreement.

> A one stop shop aided by technology for navigation of services would dramatically improve access to services for clients.
>
> - COMMUNITY SERVICES ORGANIZATION REPRESENTATIVE

ENERGY MANAGEMENT INFORMATION SYSTEM (EMIS)

To provide community energy management support services and achieve the outcomes of the Energy Poverty Reduction Program, it will be necessary for the Town to collect and monitor energy data, and to manage energy information on behalf of participating program clients. This functionality is achieved through the addition of the energy management information system (EMIS). The EMIS will provide relevant information to households-at-risk, property owners, and municipal departments, enabling them to improve the energy performance of their assets. The EMIS will operationalize the municipality's energy management objectives and provide an efficient means to audit and depict Energy Poverty Reduction Program outcomes.

The principal objectives of the EMIS proposed in the program is to support the municipality's energy management programs through:

- A comprehensive operations, sustainability and planning information system
- Visualizing and understanding the consumption of various types of energy through a set of energy dashboards and other analysis-based tools
- Quantifying energy use of individual home, buildings or processes
- Early detection of poorly performing buildings, systems or processes
- Reporting functions including auditing and the ability to identify performance trends

These functions, and their relationship to client homes and other community energy assets, are visualized in Diagram 6.2.

Features of the EMIS in the EPR system include a user focused web-based dashboard, the storage of data in a usable format, the calculation of effective targets for energy use, and comparison of actual consumption with these targets. Elements include sensors, energy meters, hardware and software, which may already exist as process and business performance monitoring systems.

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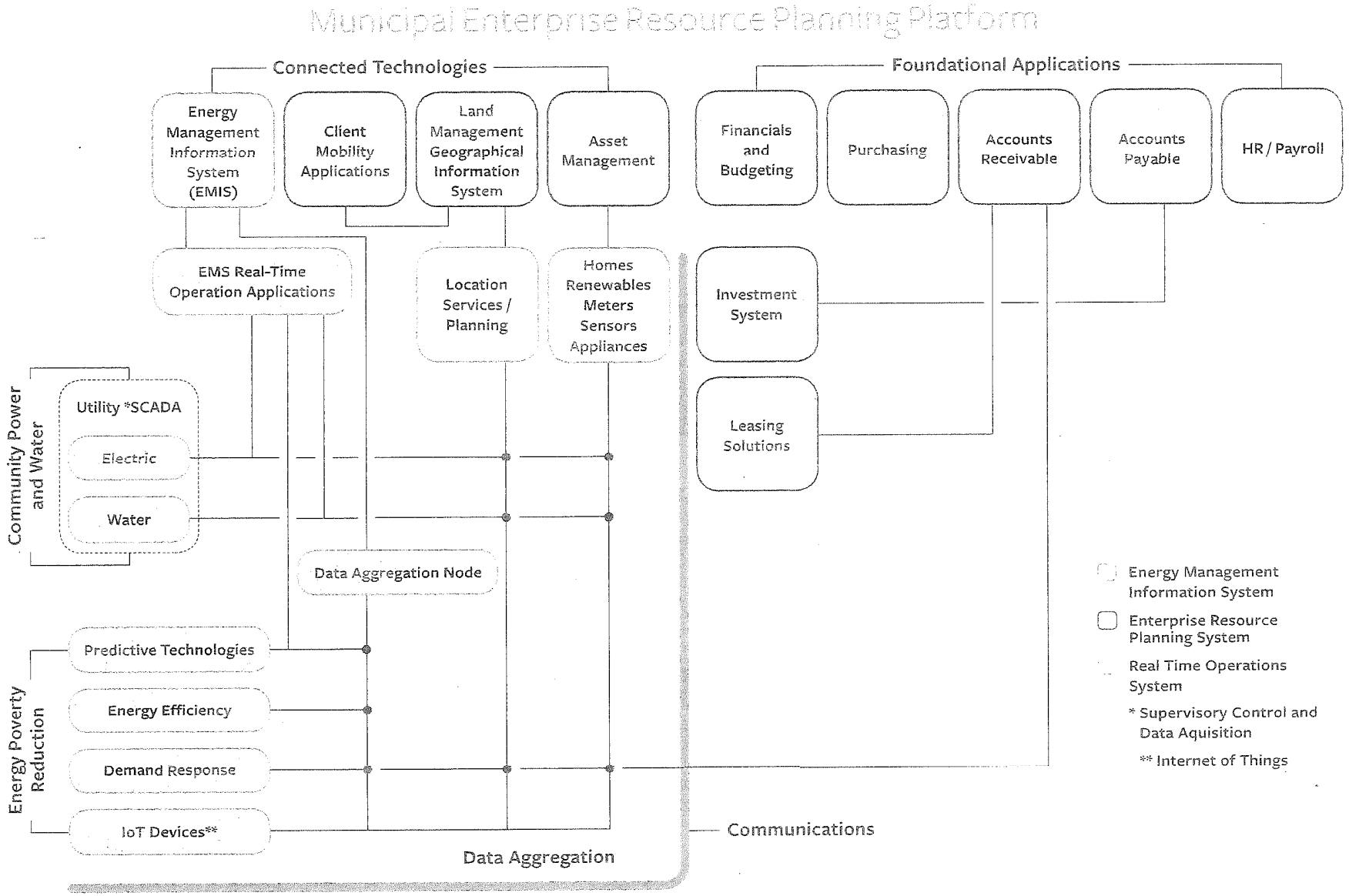


Diagram 6.1

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Energy Management Information System Overview

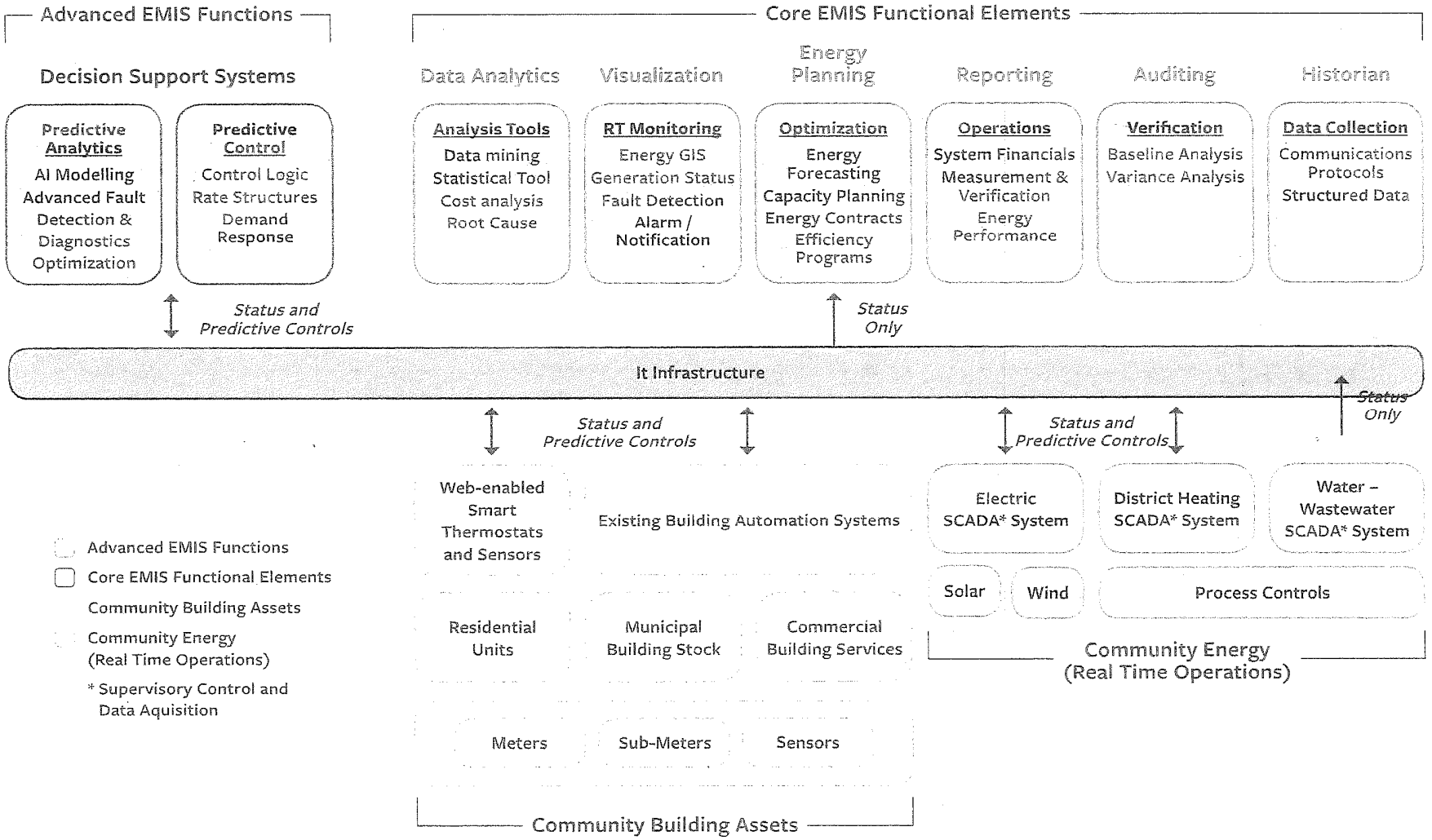


Diagram 6.2

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EMIS functionality relies on the following three components:

- **Monitoring:** the EMIS coordinates the monitored data flow from all existing real estate and energy assets. It includes energy use, generation and storage for each of the project assets in energy units - expressed in kilowatt hours (kWh) and/or gigajoules (GJ) - as well as carbon footprint - expressed in tonnes. It also includes related energy costs and the costs of energy improvements. Finally, the EMIS also includes exterior environmental conditions such as ambient weather and interior environmental conditions such as room temperature and humidity. To visualize the project outputs and results, the EMIS intends to have a comprehensive dashboard as a key program tool. It also has an advanced historian to archive compressed data without overloading the server.

- **Descriptive Analytics:** a performance and auditing tool that analyzes historical data to define the reasons for past performance successes and/or failures.

- **Predictive/Prescriptive Analytics:** an advanced analytics component that leverages real time operations (RTO) controls of energy assets and utility resources. It combines real time energy data with external data on any scale, which allows it to estimate the future energy consumption patterns of a single home, a multi-unit residential building, a neighbourhood energy system, or even the Energy Poverty Reduction Program or community as a whole. Prescriptive analytics goes beyond predicting future outcomes by suggesting beneficial energy management actions and showing the implications of each decision option.

REAL TIME OPERATIONS (RTO) SYSTEM

The real time operations (RTO) system leverages the value of the program assets and coordinates its controls in real time. The RTO system becomes active at the final stage of the program development when the core operations of its municipal enterprise resource planning system and energy management information system are deployed and in operation. The RTO system leverages the operations of the household and community energy assets in real time thus bringing additional hourly, daily, monthly and annual value to the community.

The two key parts of the RTO system are the supervisory control and data acquisition (SCADA) and the energy management system (EMS).

Supervisory Control and Data Acquisition

SCADA is a category of software application programs and hardware devices for process control. These systems gather data in real time from remote locations in order to control equipment and conditions. SCADA is used in power plants, power distribution, as well as in oil and gas refining, telecommunications, transportation, and water and waste control.

SCADA systems allow the community to:

- control distributed energy resources and industrial processes locally or at remote locations
- monitor, gather, and process real-time data
- directly interact with devices such as sensors, heating ventilation and air conditions (HVAC) equipment, photovoltaic (PV) generators, and more through human-machine interface (HMI) software
- record events into a log file

SCADA systems offer important functionality for the Energy Poverty Reduction Program's more advanced operations as they help to maintain efficiency, process data for smarter decisions, and communicate system issues to help mitigate downtime.

Energy Management System

The main goals of sustainability in the grid revolve around economic operation, reliability, and environmental impact. One of the main advantages of the energy management system

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(EMS) is that it can supply households with electricity and guarantee the reliability and intelligence of the power system.

The EMS can receive supervisory control signals based on requirements of the main grid. The system's operation policy depends on the ownership structure, connection status and market model.

The major reasons for the RTO-enabling energy management systems are as follows:

- accommodates intermittent distributed energy resources such as solar panels or energy storage in the grid
- reduces grid operation cost and emissions, thereby increasing energy efficiency
- improves grid stability, reliable fault ride-through and seamless mode transitions making the entire system more resilient

RTO - Energy Management Cycle

The RTO energy management cycle, presented in Diagram 6.3, illustrates the power of RTO functions when they work together to reduce energy poverty. This cycle forms the heart of the data and connected technology-driven energy performance improvement process, as communications between smart systems increase energy savings and energy generation. This enhances financial returns, enabling further investments in energy solutions.

CONNECTED TECHNOLOGY APPLICATIONS FOR ENERGY POVERTY REDUCTION

Connected energy technology applications are the practical on-the-ground solutions that work in unison with the data platforms described in the previous sections, and whose functions are enabled and enhanced through those platforms. These applications have a common purpose in reducing energy costs and increasing energy security for Bridgewater residents. They fall into 2 categories: connected energy efficiency solutions and connected clean energy solutions.

CONNECTED ENERGY EFFICIENCY SOLUTIONS

These are digital controls that use advanced analytics to generate energy savings:

- Smart Appliances: a smart appliance is connected to other devices or networks via wireless protocols such as Bluetooth, Wi-Fi, 3G, etc., that can operate to some extent interactively and autonomously. Smart appliances utilize modern computer and communications technology to make functions faster, cheaper and more energy-efficient.

Real-time Operations Energy Management Cycle

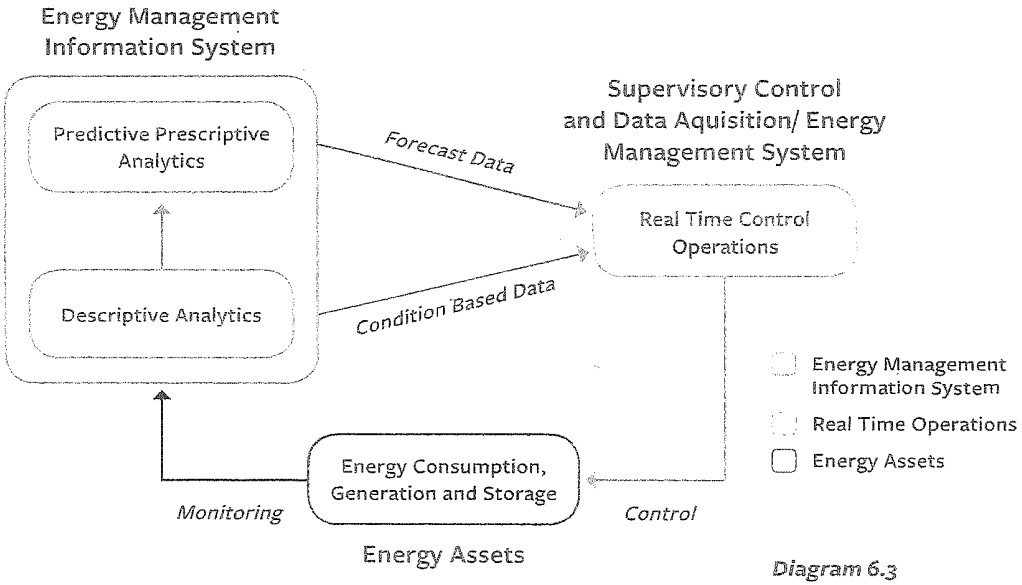


Diagram 6.3

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- **Smart Thermostats and Smart Meters for Households:** smart thermostats and smart meters form a two-stage approach to the connected technology strategy. When coupled with advanced analytics and artificial intelligence, smart thermostats can be networked or clustered together in the community to participate in a broader energy management control system.

- **Smart Thermal Optimization:** smart thermal optimization for multi-unit residential buildings (MURBs) improves the efficiency of a building's energy use by anticipating and reacting to the changing weather conditions and requirements for heating and cooling in real time. Because weather and heating/cooling loads can vary significantly throughout the day, the impact of intelligent prediction is significant. This allows for reducing building heating and cooling energy costs by on average by 10% to 25% while improving tenants' thermal comfort.

CONNECTED CLEAN ENERGY SOLUTIONS

Electricity grids are experiencing a major transformation. Connected technologies improving energy efficiency of electrical loads (such as buildings and electric vehicles) and distributed energy resources (like solar PV and energy storage) make grid operations increasingly complex. They also maximize the potential of clean, robust and flexible power grids in a low carbon future. The following connected clean energy solutions allow for the development of residential microgrids, which has a transformative impact on the power grid:

- **Residential Solar PV for Households:** residential solar PV systems can supply households-at-risk with clean, reliable and affordable electricity. When enabled with connected technology, they help coordinate the household's electricity use with the rooftop solar energy generation potential.

- **Combining Solar PV and Storage:** adding energy storage to a grid-connected PV system allows households-at-risk to store surplus solar energy for use later in the day, and provides a back-up power supply in the event of a power outage, thereby increasing energy security.

- **Predictive Energy Management (PEM) for the Community:** an emerging connected technology for reducing energy use for heating, ventilation and air conditioning (HVAC) of houses and buildings while enabling on-site solar energy generation and storage to provide auxiliary services to utilities in real time. It features coordinated supervisory predictive control of energy consumption, on-site generation, storage and ancillary services for hosting utilities. PEM promises to be a flexible distribution system infrastructure that promotes increased levels of distributed renewable energy generation and enables improved control and automation on the electricity distribution grid. The PEM solution also provides flexibility within smart grid implementation to support future innovative applications, such as energy storage, and incorporate principles of modularity, scalability and extensibility into smart grid planning.

FEASIBILITY ASSESSMENT

The feasibility of the connected technology solutions discussed above, has been confirmed by the research done in this final application development stage. Town of Bridgewater and our Townsuite Municipal Software service provider have experience and expertise with advanced ERP systems. We can confirm that key features of the software are well known, understood and tested in the municipality.

The EMIS Planning Manual and Tool[4] and the Canadian Industry Partnership for Energy Conservation (CIPEC), as well as EMIS practices and documentation have been reviewed by our technical team. The NRCan's EMIS approach is

[4] Developed and tested by Natural Resources Canada

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based on innovative energy management and strong experience in the industry and makes the proposed EMIS completely feasible for the Town of Bridgewater, and a new standard for municipalities in Canada. The key innovation in the Energy Poverty Reduction Program is related to high resolution predictive analytics and its focus on improving lives of at risk households rather than those who can afford it.

The real time operations (RTO) system for the Town of Bridgewater is based on digital SCADA coupled with energy management systems (EMS). These systems are used in many industries throughout Canada and abroad, thereby strengthening the program's ability to be replicable and scalable. Based on a review carried out by the program's technical team the proposed digital SCADA/EMS combination is highly feasible for municipal utility applications.

OPEN TECHNOLOGY PRINCIPLES AND ARCHITECTURE

One of the major inhibitors to the adoption of connected technology in smart buildings and smart cities has been the lack of interoperability between different building systems. The program's connected technology solution ensures that all connected devices are speaking the same language, allowing them to 'talk' to each other and exchange information.

Adopting open protocols for houses and buildings, such as LonWorks or ASHRAE's open-source BACnet, allows all systems to communicate in a common protocol language. These common protocol languages define the arrangements under which devices and systems interact and communicate with each other.

One key advantage of open standards architecture and open protocol systems is that they enable the integration of new devices and internet of things (IoT) sensors and systems, as long as these devices also communicate using an open protocol language. A building that adopts open architecture standards is, therefore, effectively 'future-proofed' against vendor-generated proprietary constraints through the international standard EN62402 Obsolescence Management Safeguards. Thus, new functions and devices can be easily installed when enabling technologies are developed. This is further supported by our commitment to a local workforce that will be trained to implement and operate the technologies and systems going forward.

GENERATING INTELLECTUAL PROPERTY

The program will generate intellectual property (IP) for the community and the households-at-risk related to social and technical navigation, solutions, services, and related connected technology. The program team recognises that free access to, and reuse of, these open licences is an essential part of making the program replicable to other communities and the Town is committed to sharing IP so long as privacy is not compromised.

The program will support the distribution of connected technology IP through:

- the release of IP for connected technology using open licences or other relevant instruments - while respecting intellectual property rights - so that no restrictions or charges are placed on the re-use of the information for non-commercial or commercial purposes, save for exceptional circumstances;
- the release of IP for connected technology using application programming interfaces (APIs), where appropriate, to ensure easy access to the most regularly updated and accessed connected technology; and
- encouraging innovative uses of our IP for connected technology through mentoring for its users nationally and internationally.

TECHNOLOGY IMPLEMENTATION PLAN

TECHNOLOGY IMPLEMENTATION TIMELINE

The timeline for the program's connected technology solution is described in Table 6.1.

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STANDARDS AND GUIDELINES

Enterprise resource management, EMIS, SCADA/EMS, and connected technology guidelines and standards will be communicated to, coordinated with, and confirmed by connected technology partners, vendors and energy service providers to ensure full technology interoperability where necessary.

These standards and guidelines will also be discussed with and confirmed by the connected technology partners, vendors and energy service providers to ensure and guarantee the replicability and scalability of program during the Smart Cities Challenge timeframe, toward 2030, and beyond.

The following standards and guidelines have been thoroughly reviewed for consideration:

- Canadian Standard on Enterprise Resource Planning Systems
- ISO 50001 Energy Management Systems Standard
- The International Society of Automation - Standard ISA112 SCADA Systems
- International Electrotechnical Commission - IEC 61968 Standards Based Integration for Distribution Management System
- Natural Resources Canada - Energy Savings Toolbox
- Natural Resources Canada - Energy Management Information System

ROLES AND RESPONSIBILITIES OF TECHNOLOGY PARTNERS

The program team over the finalist proposal phase has built strong relationships with a variety of connected technology solution partners and has communicated accessibility and usability of the connected technology solutions to the households-at-risk, community energy owners/operators, energy service providers, investors, and other stakeholders that support their uptake and acceptance in the program. This allows the program team to keep confident in the commitments of the partners during the program timeframe and towards the community's long-term objectives, to ensure the value to the households-at-risk and to the municipality, and to enable and train the municipal and community services' workforce. These partners are identified in the **Project Management chapter.**

Technology Implementation Plan: Energy Poverty Reduction Project Connected Technology Solution Timeline

Relationship to Smart Cities Challenge (SCC)	**Within SCC Program & Funding**			**After SCC**
Phase	1: Prototype Program Setup	2: Prototype Program Testing & Refinement	3: Final Program Activation	4: Program Maturity
Timeframe	2020-2022 (2 years)	2021-2024 (3 years)	2024-2025 (1 year)	2025-2030 (5 years)
Municipal Enterprise Resource Planning (ERP) System	Definition and Deployment of Modifications to Existing ERP Module	Definition and Deployment of EMIS Connectivity	Full Operation	Full Operation
Energy Management Information System (EMIS)	Definition and Deployment (houses)	Development and Deployment (MURB) RTO Monitoring/ Analytics Integration	Full Operation	Full Operation
Real Time Operations (RTO) System	Municipal RTO System Design	Deployment and Testing (houses, MURB and municipal buildings) Community Energy Integration	Full Operation	Full Operation

Table 6.1

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The Town of Bridgewater proposes that the use of data and connected technology will catalyze energy related activities and outcomes. The data platforms selected will apply industry best practices to secure highly sensitive data collected from the Coordinated Access System, Municipal Enterprise Resource Planning (ERP) platform, Community Energy Systems, and Investment Systems. Further, it will defend against security breaches and protect personal information and privacy. Through continuing Energy Poverty Reduction Program efforts, Bridgewater will demonstrate to the community a commitment to responsibly managing data through its lifecycle with security and privacy considerations addressed.

ENERGY POVERTY REDUCTION DATA

DATA TYPES AND SOURCES

The Energy Poverty Reduction program expects to process data related to the following groups: household, property/asset, energy efficiency solutions and services, and investors.

TYPES AND METHODS OF DATA PROCESSING

The types and methods of data processing in the program include collection, generation, analysis, storage, and transmission of important data related to existing foundational ("legacy") technologies and connected technologies.

- **Open data:** this is all data that is (a) non-privacy-restricted and non-confidential, (b) produced with either public or private resources and (c) made available without any restrictions on its usage or distribution. The municipal methodologies to manage open data are an open data portal and an open data policy.
- **Personal information, personal health information, and non-personal information** (as defined in *FOIPOP act*): this is data that is restricted and/or licensed and requires permission to be published or distributed; it includes data held privately because its value has not yet been identified. The municipal instruments to manage private data are data security and privacy policies, procedures, legislation and regulations, as well as authentication and access controls.
- **Commercial data:** these are all types of licensed data with a financial value for use and distribution. Commercial data may be produced with either public or private resources. The municipal instrument to manage commercial data are data security and privacy policies, procedures, legislation and regulations, contracts, licenses, data transaction platforms, and data policies and principles.

The program's data platform concept also enables re-use and re-distribution of data, as well as derivative production, archiving, and preservation of data that reflects the entire data lifecycle in the Energy Poverty Reduction Program's design. This includes individual data related to households-at-risk processed in the Coordinated Access System, energy poverty reduction solutions and services data as well as energy use, generation and storage and environmental data processed in the municipal enterprise resource planning (ERP) platform, investments and other related data processed by the Investment Systems.

DATA USE

Accurate and timely data disseminated through technologies described in the **Technology chapter** is a crucial component to all 5 systems defined in the VISION chapter for the following reasons:

- **Community Energy Systems:** Energy produced by these systems credit participating household energy use.
- **Housing Energy Management Systems:** Energy use from the household level down to the appliance level define energy savings and promote it through demand-side-management and analytics.

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- **Coordinated Access Systems:** Data stored in the system streamlines Town and community service organization operations.

- **Mobility Improvement Systems:** Data shared through the above systems allow Town Planning and Operations to increase the ability of at-risk residents meet their mobility needs.

- **Investment Systems:** Energy savings and production earnings need to pass to investors in accordance to investment offerings.

DATA SECURITY

In alignment with the philosophy of "privacy by design", the program has applied focused efforts to integrate data security and privacy considerations into the project design; this was particularly important for the households-at-risk but is valued by all stakeholders.

The Town of Bridgewater and/or contracted proponents will control and own all data collected using the program's data platform including any modifications, improvements, and derivatives of such data. The data is personal and confidential and will not be disclosed or made available unless approved by the Town of Bridgewater. This data will be assessed using a Threat and Risk Assessment methodology prior to holding any live data.

IDENTIFICATION OF RISKS

Through the development of this application, we have been progressing with the identification of risks and the development of appropriate mitigating strategies for data management of the households at-risk of energy poverty. This includes completion of a preliminary Privacy Impact Assessment as part of this proposal.

ENERGY POVERTY REDUCTION DATA PLATFORM

CONCEPT

The Energy Poverty Reduction data platform will harvest the data generated by energy efficiency and clean energy solutions for households-at-risk, inform decision-making of households, the municipality and the stakeholders, and will advance and improve the performance and application of the connected technologies used. The Energy Poverty Reduction Program will also leverage its resources to build and maintain in-house analytics. The Town will develop an Energy Management Information System (EMIS) to collect, process and analyze the data provided.

STRUCTURE

The Town of Bridgewater sees the program's data platform as a leading smart city platform ensuring interoperability of/integration with existing federal, provincial and community data platforms and has identified high quality candidates for these functions.

> We understand that data and connected technologies can tremendously benefit cities or small communities enabling the discovery and more in-depth understanding of the needs of the local population
>
> DALHOUSIE UNIVERSITY PROFESSOR

The data platform will include three major components: Coordinated Access System, Municipal Enterprise Resource Planning (ERP) platform and Investment Platforms.

The Coordinated Access system is planned to allow community organizations and service providers to collect and manage personal and personal health information on clients who are housing-insecure or homeless. This data platform will reside outside of the Town's municipal services and be used by community partners for the Coordinated Access System that would support households at risk.

The connected technology solutions enabled through the ERP platform will coordinate the households and the municipality's real estate and energy assets and energy solutions. This will be a split internally- and externally-accessed platform providing all necessary analytics and controls data for real time and planning/ reporting operations.

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There will be an internal and external investment platform orchestrated by an Investment Navigator. Community and traditional investment data will be housed in a secure database, abiding to federal and provincial rules and regulations hosted by an organization procured by the town.

FUNCTIONALITY

The data platform provide the following functions:

- **Acquisition/Interconnection:** These provide data capture mechanisms from the collection systems.
- **Data/Knowledge:** These support data processing, adding value and transforming information into knowledge.
- **Interfacing:** These enable access to information at different levels.
- **Service support:** These coordinate all the possible services involved in each action developed out of interoperability functions.
- **Security and management:** These provide horizontal functionalities such as audits, monitoring and security.

Two key interfaces allow for communication between the above group of functions:

- **Acquisition:** This interface with the program data platform enables information collection from the external elements.
- **Interoperability:** This interface with the program data platform enables communication with external data providers and the third-party computation systems.

INTEROPERABILITY WITH CONNECTED TECHNOLOGY SOLUTIONS

DATA SERVICE PLATFORMS ENABLED BY CONNECTED TECHNOLOGIES

The Energy Poverty Reduction Program data platform will have access to different information sources, share resources, analyse capacity and coordinate services, usually based on predictive analysis. The concept referred to as "horizontality" is to be applied to the program. Through "horizontality" information from various sources interact with one another in order to provide streamlined services and operations.

INTEROPERABILITY WITH DATA SERVICE PLATFORMS

Data service platforms enabled with connected technologies provide various services in specific areas. These service platforms (known as "verticals") are provided by supervisory control and data acquisition (SCADA) or more complex platforms. Most of the time these platforms are independent and do not share resources, or they do so sparingly.

The introduction of the program's data platform will enable the integration and optimization of vertical service platforms and facilitate the exchange of information and resources between these vertical service platforms. On one hand, the resources and systems used by the vertical platforms supporting the same functions can be pooled and on the other hand, the information that is stored and processed by one vertical platform can be used by the others, enabling the generation of cheaper, more valuable and more complex services.

Vertical platforms will be integrated with the program's data platform in two ways. They can be deployed inside the program or can be integrated using open interfaces, in which case the processes and resources required by the vertical platform could not be deployed inside the Energy Poverty Reduction program.

Open interfaces are required to interconnect the program's data platform with other municipal platforms enabling other systems to interoperate with the program more efficiently. In the integration process some resources, such as data source, can be shared. Since the services can access more data sources, it is possible to create new services and improve those that already exist. Predictive analysis is also facilitated, because more data sources are accessible.

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The program's data platform could interoperate with external providers' platforms, and its interfaces are required to be adapted. The adaptation of these interfaces will depend on the type of platform.

DATA PLATFORM SECURITY

The Town of Bridgewater will control and own all data collected by the Energy Poverty Reduction Program data platform including any modifications, improvements, and derivatives of such data. The data is personal and confidential, and thus will not be disclosed or made available unless approved by the Town of Bridgewater. At all times the program's data platform and related technologies must be compliant with all applicable privacy legislation provincially. Cyber management is examined in further detail in the preliminary Privacy Impact Assessment (PIA).

NETWORK SECURITY

The network provider will take a number of steps to ensure the security of their networks. A dedicated team of security professionals will focus on network security and security governance. This will include, but is not limited to, multiple levels of security such as service security authentication mechanisms, secure access to client locations/sites, change control validations/ processes/policies and network monitoring tools/ applications/audits. This will be confirmed through the completion of a Threat and Risk Assessment. The Office of the Information and Privacy Commissioner for Nova Scotia (OIPCNS) has outlined the importance of designating a Chief Security Officer who is responsible for security: IT system maintenance and security, security awareness, ensuring digital and physical security, etc. for both the program and municipality. The Town will act on this recommendation as part of the detailed program design.

RESILIENCY

The Energy Poverty Reduction data platform will ensure the ongoing operation of services according to established service level agreements. These services may require availability 24x7 and a service level of over 99.9% annually. Providers may offer solutions complying with these requirements.

CYBER THREATS MANAGEMENT

Cyber threats to the program's data platform will be addressed through cybersecurity scanning and tests in the Platform, for threats such as malware, phishing, spear phishing, lost or stolen devices, distributed denial of service.

OPEN DATA AND BIG DATA STRATEGIES

THE OPEN COMMUNITY

The municipality's need for transparency and accountability has always been seen as fundamental by the Town of Bridgewater. The community is very supportive of the Open Government Partnership (OGP) created in 2011 and having Canada among its 75-member countries.

OPEN DATA FOR THE ENERGY POVERTY REDUCTION PROGRAM

The Town will make certain data types open to public stakeholders through online portals. This will come at no cost to the user and a standard license to allow re-use and distribution may apply.

Municipal data, like any data collected by public institutions, are subject to privacy legislation for personal information and other restrictions which limit it being made public (e.g. intellectual property).

The program defines the data spectrum including closed data (internal access), shared data (with group-based access) and open data (with public access and open to everyone).

The program data management addresses important Open Data strategy development related to high resolution environmental data and data analytics, public housing and mobility data and data analytics as well as public data on energy efficiency and clean energy solutions and services for the Bridgewater community.

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COMMITTING TO G8 OPEN DATA CHARTER: BEST PRACTICES

The EPR project is committed to all 5 Open Data Charter[5] best practice principles, in accordance with Federal and Provincial legislation and regulations.

BIG DATA STRATEGIES

Big data that is collected through the Energy Poverty Reduction Program will allow municipal policies makers to make decisions based on real information, enabling them to further improve energy performance, related energy use, mobility and transportation decisions, etc.

PERSONAL DATA AND INFORMATION PRIVACY

PERSONAL INFORMATION FOR ENERGY POVERTY REDUCTION

The Smart Cities Challenge approach uses real-time and actionable data to inform the operation of community-wide systems and services. The Energy Poverty Reduction Program demonstrates the inclusion of measures to protect personal information and privacy and respects the fair information principles.

Personal information is data about an "identifiable individual." It is information that, on its own or combined with other pieces of data, can be used to identify a specific individual. In some circumstances, information that may appear to be non-identifiable may still qualify as personal information if there is a risk of re-identification. See Preliminary PIA for *FOIPOP act* considerations.

Health information in the Energy Poverty Reduction Program can include, items as defined by Nova Scotia's PHIA act. See Preliminary PIA for PHIA act considerations.

The program's information will be combined and analyzed with data from different sources and could become identifiable personal information. To mitigate this risk, the program team will seek to de-identify personal information at the earliest opportunity, and always pursue the least privacy-invasive options wherever possible. See the Preliminary PIA for further details surrounding data consent, data sharing opt-out options, server locations, data ownership and governance, safeguards and transparency.

HOMELESS INDIVIDUALS AND FAMILIES INFORMATION SYSTEM (HIFIS)

The Homeless Individuals and Families Information System (HIFIS) software is owned by Service Canada which it shares nationally with communities to assist services delivery agencies track and report on their efforts, ultimately supporting vulnerable households; those who are homeless or at risk of being homeless. The HIFIS system is undergoing upgrades to a cloud-based system allowing for fluid information sharing between services organizations. Individuals seeking homeless related services, through local service providers, no longer have to repeat their stories multiple-times to each party, as their HIFIS profile is now shared amongst services organizations granted the client provides consent. Two service organizations within the Town currently use HIFIS (Freeman House and Second Story Women's Centre), and it's expected this number will grow as the newest iteration rolls out.

Through attending a HIFIS training session, correspondence with community service organizations, dialogue with the Affordable Housing Association of Nova Scotia (AHANS), and examining research that suggests energy poverty contributes to housing insecurity, the Town has identified HIFIS as being a key component to the Energy Poverty Reduction program. One has the ability within HIFIS to create unique fields and surveys, for specific programs, which can be partitioned off from other community service programs and organizations at the household's request. The Town will create its own survey and fields for the purposes of tracking program outcome indicators.

[5] G8 Open Data Charter: Technical Annex https://opendatacharter.net/g8-open-data-charter/

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Energy meters on the side of an apartment building.

This data platform would reside outside of the Town's municipal services and an agreement would need to be established between the municipality (or to be determined service organization) and AHANS, who has a contract with Service Canada, or Service Canada itself. This would allow our household indicators to be stored on AHANS's HIFISNS Network host (Canada Web Hosting) which meets Federal Government security standards.

The Office of the Information and Privacy Commissioner for Nova Scotia (OIPCNS) has outlined their concerns related to HIFIS . These concerns include creating a more robust view of a household through information gathered by the program and potentially Federal government access to this information. The Town will address these concerns through a Privacy Impact Assessment (PIA) as outlined in the Preliminary PIA.

PRELIMINARY PRIVACY IMPACT ASSESSMENT

To support the selection and design of a comprehensive data management system, the Town of Bridgewater developed a preliminary privacy impact assessment (PIA) for the Energy Poverty Reduction Program. The PIA includes a map depicting all of the program's anticipated data flows for the key project activities: Intake, Service Delivery, and Monitoring and Analytics and qualified their associated security and privacy risks. While developing the preliminary PIA the Town of Bridgewater staff actively consulted with the Office of the Information and Privacy Commissioner (OIPC) of Nova Scotia to ensure that the program design conforms with all applicable privacy laws and best practices. Project staff also worked with the Town's Finance Department and the Municipal Joint Services Board (MJSB – IT Services) to ensure that project IT needs can be met and are compatible with existing services and infrastructures.

Through the PIA, the Town of Bridgewater demonstrates that relevant privacy authorities were consulted, and their guidance was considered during the program and application development. The PIA reviews and supports the Energy Poverty Reduction Program's compliance with relevant municipal, provincial/territorial, and federal privacy regimes.

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ENGAGEMENT ACTIVITIES UNDERTAKEN TO DATE

INITIAL APPLICATION PHASE: JANUARY – APRIL 2018

We looked to the public to teach us about energy poverty, their experiences, core concerns, and suggestions on how a Town strategy could reduce energy poverty. Feedback from over 200 residents reinforced public support for reducing energy poverty. The submission of the Town's initial application to Smart Cities Challenge, and its eventual selection as a Finalist, was met by enthusiastic support from the community and our stakeholders, a support that has continued to grow continuously over the course of the Final Application development phase.

FINAL APPLICATION PHASE: JUNE 2018 – MARCH 2019

We produced a comprehensive Community Engagement Plan that identified the project's primary stakeholders and identified the outcomes of the program that were relevant for each group. For each group, it planned a schedule of engagement activities, complete with desired engagement outcomes. The Community Engagement Plan was implemented through the following activities:

1. Energy Poverty Research Program

This program sought to document and better understand the lived experience of energy poverty. It included the following:

Interviews: 20 interviews were conducted, consisting of 12 women and 8 men with a broad age distribution of 18 – 65 and over; 75% of interviewees were renters, 10% lived in affordable housing, and 15% owned their home; and 12 participants received income assistance and 8 did not.

Focus Groups: 57 individuals participated in the focus groups, consisting of 38 females, 16 males, and 2 transgendered females; 45 renters and 11 owners; and 50% of participants were on income assistance.

Key Findings:

- Many individuals living in energy poverty have developed energy management strategies for dealing with their energy burden;
- Several demographics are more at-risk for energy poverty including: single mothers, African Nova Scotians, seniors, and those with health conditions and disabilities;
- Energy poverty has a severe impact on a household's ability to spend on other essential goods and services, forcing trade-off decisions on food, health, and entertainment;
- Residents are highly supportive of long-term community-based solutions which provide greater access to quality housing, affordable energy, and greater mobility options.

The research program provided the opportunity to build early relationships with our eventual clients and include our learning into the program design. To promote involvement, the Town offered an honorarium of $20/hour for program participants.

2. Engagement of Community Stakeholders

Workshops. A series of 8 workshops involved open discussion on almost every component of our application. Over 30 organizations have been represented at workshops, with over 140 representatives in attendance. Some of the key learning outcomes that were achieved through the workshops include:

- Service organizations with a diverse range of mandates identified energy poverty as one of their clients' key challenges and a core service priority;
- Service organizations endorsed addressing the systematic causes of energy poverty;
- Data and connected technology solutions were identified as essential to increasing collaboration and efficiency of resource allocation for service organizations.

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Interviews: We undertook 15 one-hour interviews with representatives of partner organizations. From these interviews we learned that:

- Partners have insufficient resources to address the basic energy, housing, and transportation needs of their clients;
- Partners are supportive of a coordinated access system for their clients;
- Spending on energy related services constitutes a large portion of many organization's budgets;
- To reduce costs, there needs to be a shift from spending on emergency services to preventative services.

3. Engagement of the Public at Large

The Town involved a substantial number of individuals by utilizing a range of in-person and online engagement activities.

Youth Video Documentary: The Town worked with the HeartWood Center for Community Youth Development, the Department of Community Services, and Picnic Studios to bring together a video team comprised of 5 youth-at-risk from Bridgewater and area. The youth team created a video documentary called *Living in Energy Poverty* which was premiered at an Open House on January 17, 2019. Parts of the footage was incorporated into the Town's 5-minute Smart Cities Challenge video pitch. The documentary has received regional recognition for how it captured the lived experience of energy poverty and was featured in a CBC Nova Scotia article about energy poverty in Bridgewater.

Community-Wide Paper Survey: A paper survey yielded a total of 585 responses, representing 15% of Bridgewater households. Important program information received through the survey included:

- 38.5% of respondents said that they had difficulty affording energy costs and spent more than 10% of their after-tax income on energy and transportation costs. This indicator will act as a baseline to track our energy poverty rate as part of program performance and measurement.
- Responses were tracked by housing type and neighbourhood, which informed the mix of housing ages, forms, and heating systems used to inform this proposal's financial outcomes and energy analysis.

Thematic Surveys: We received a total of 278 responses from 4 different thematic surveys, covering housing; transportation; health; finances; and employment and training. Some of the key findings from the surveys include:

- 74% of respondents stated that they had faced difficulty paying rent, energy bills, or transportation in the last five years;
- Middle income households can also suffer from energy poverty.

Social Media: Town staff routinely engage residents using social media to answer questions, and provide further information related to the Energize Bridgewater and Smart Cities Challenge programs.

Video and Image Media: 10 videos were produced to document the Town's workshops with partners, engagement with residents, and illustrated the Town's application. This content was shared over the Energize Bridgewater and Town of Bridgewater social media pages. An interpretive exhibit was created that featured quotes shared by participants from interviews and focus groups. The exhibit has been displayed in four locations across town to initiate further engagement with the community on energy poverty.

Open Houses: On January 17, an open house was held for the public at large that premiered the youth video documentary described above. On March 29, a final open house will explain the community's final application to the public.

ENGAGEMENT PRINCIPLES GOING FORWARD

The design of the community engagement approach for the Energy Poverty Reduction Program is founded on 5 principles:

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1. **Consideration of full-spectrum needs:** engagement efforts will be designed based on an integrated understanding of the needs and aspirations of program clients and partners. This ensures that their voice matters, and that emerging risks and challenges are addressed in a timely fashion. Design and evaluation of engagement efforts will consistently refer to the broad set of desired program outcomes.

2. **Inclusion and accessibility:** these principles will continue to inform the design of the program. Ongoing efforts to understand the needs of clients, use a trauma-informed lens for service design and delivery, evaluate which voices are not being heard, and challenge assumptions and stereotypes, will help meet inclusion goals. The accessibility of the program will also constitute an important evaluation criterion for program partners, in particular the Coordinated Access System and the Housing Energy Improvement System.

3. **Empowerment:** the central purpose of the program is to enhance energy management capability for program clients and throughout the community. This principle extends toward ensuring that program clients have a say in program design, delivery, and evaluation. It is operationalized through engagement structures such as the Client Advisory Circle and the role of the Ombudsperson, continuous feedback from clients and partners, and the use of connected technologies to better access information and communicate needs. For program partners, it means participation in the program governance structure, and through ongoing feedback and evaluation processes.

4. **Consent:** obtaining informed consent to receive program services and to share data is critical for fostering trust and encouraging participation. The Town and its service delivery partners must ensure that clients are appropriately informed about the services that they will be receiving, as well as their rights and responsibilities as clients.

5. **Navigation support:** the provision of extensive navigation services is necessary to help clients overcome difficulty in navigating community and government support systems and bureaucracies. The Household Navigator, working through the Coordinated Access System embodies this principle for households-at-risk, as do the Technical Navigator and Investment Navigator roles for property owners and investors, respectively.

PROGRAM CLIENTS, STAKEHOLDERS, AND ENGAGEMENT TOOLS

Energy Poverty Reduction Program stakeholders are described below, along with engagement objectives and tools that have been tailored to their needs:

Households at Risk of Energy Poverty

Currently estimated at 38.5% of Bridgewater's population, these residents are a primary client of the program. Engagement objectives and tools:

1. ***Ensure that clients' voices and needs are heard as part of the program design and evaluation.*** Engagement activities include representation on the Client Advisory Circle, active participation in program design through focus groups, interviews, surveys, and service testing, and through feedback from program partners who serve these clients.

2. ***Connect clients to the community and energy services they require.*** Engagement activities will be driven by the Coordinated Access System and its Household Navigators. It will provide high quality, accessible services that are designed specifically with an eye to serving the broad range of needs and levels of urgency experienced by households-at-risk. In delivering coordinated access services,

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clients will be educated on their options, rights and responsibilities in sharing their personal data. A Communications Strategy will be developed to attract clients.

3. ***Empower clients to better manage their energy systems.*** Engagement activities will include the provision of energy management services for clients who are also homeowners, and referral of landlords to these services if the clients are renters. A home energy 'dashboard' will be provided to clients, with an ever-growing set of energy management solutions as those become available from the evolving Energy Management Information System and community energy systems. Clients receive energy management training to build their skills and knowledge, and to share with other clients those energy management practices that they have already developed and refined.

Property Owners

Bridgewater property owners whose properties are inhabited by households-at-risk of energy poverty are a primary client of the program. Engagement objectives and tools:

1. ***Ensure that clients' voices and needs are heard as part of the program design and evaluation.*** Engagement activities are the same as for households-at-risk.

2. ***Connect clients to the technical solutions they require.*** Engagement activities will be driven by the Housing Energy Management System and its Technical Navigators. High quality, accessible services will be provided, with attention to the needs of landlords to help them overcome split incentive issues that often complicate energy improvement efforts. Clients will be educated on their options, rights and responsibilities in sharing their personal and property data. A Communications Strategy will be developed to attract program clients.

3. ***Empower clients to better manage their energy systems.*** Engagement activities are the same as for households-at-risk.

Investors

Program capitalization will be achieved by attracting and retaining investments from specialized funders, as well as traditional and community investors. Engagement objectives and tools:

1. ***Ensure that investors' voices and needs are heard as part of the program design and evaluation.*** Engagement activities will centre around direct outreach during the program design and prototyping phases to ensure that program outputs, outcomes, and financial returns represent adequate value for investment.

2. ***Achieve investments for the program.*** Engagement activities will centre around continuous outreach, marketing, and reporting to investors. Investors will learn about investment opportunities and their benefits, including the ability to leverage further funding, and to reduce long-term costs to these agencies through efficiency gains that come from coordinated housing improvements and community services provision. Traditional and community investors require detailed financing prospectus documents to attract their investment interest. Maintaining investor relationships is a key activity for the Investment Navigator and the Financial Investment Vehicle.

Service Delivery Partners

Program governance and service delivery will involve multiple levels of relationships with project partners and service providers. Engagement objectives and tools:

1. ***Develop a strong and committed partner network.*** Engagement activities will involve building on existing relationships with essential program partners such as Efficiency Nova Scotia,

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TownSuite Municipal Software, the South Shore Housing Action Coalition, Family Services of Western Nova Scotia, and others. Stakeholders will continue to advise on goals, metrics, data needs and benefits, use cases for data, budget, policy, operations, end-user needs, and program governance. Partners will be invited to apply to the Energy Poverty Reduction Program Steering Committee and Technical Advisory Committee to support the program's governance and advisory functions as described in the **Governance chapter.** Broad participation from community partners will be required to design the Coordinated Access System and to provide access points throughout the community. Led by the Program Coordinator, ongoing evaluation processes with partners will ensure continued engagement.

2. ***Maintain program quality and manage risks.*** Once program services have started, engagement activities will revolve around quality control and evaluation. All service delivery partners will be involved in the processes described in the **Project Management chapter.** This will extend to engagement with regional trade networks and supply chain capacity building.

Acadia First Nation

The Town of Bridgewater is in Kespukwitk (Land Ends) on the unceded territory of the Mi'kmaw. Acadia First Nation (AFN) is the Mi'kmaw Nation within whose territory Bridgewater is located. Guided by the Community Engagement Plan, Bridgewater Town Council issued a formal expression of interest in 2018 to initiate government-to-government relations with AFN. The Town will **continue to develop this relationship.** Engagement activities will focus on cultural exchange, knowledge transfer, and the identification of partnership opportunities for energy-related initiatives that achieve mutually beneficial outcomes.

Senior Government and Other Communities

The Province of Nova scotia and the Government of Canada have jurisdiction over legislation, regulations, policies, and programs that influence energy poverty risk factors for Bridgewater residents as well as for other communities. Engagement objectives and tools:

1. ***Inspire positive change across the Province and the country.*** Engagement activities will be centred on knowledge transfer and advocacy, so that energy poverty solutions developed in Bridgewater can achieve broader systems-level impact. Participation in the Smart Cities Challenges offers a powerful platform to do so.
2. ***Inspire energy poverty reduction actions in other communities.*** Engagement activities will be centred on knowledge transfer. The Town will also use its regional networks and its membership in the Federation of Canadian Municipalities to achieve these ends.

General public

The community of Bridgewater at large, plus surrounding communities, will have ongoing interest in the program, and receive direct and indirect benefits from it. Engagement objectives:

1. Openly communicate program outcomes and benefits to the community.
2. Receive feedback on broader program benefits and outcomes.

MONITORING AND EVALUATION

The evaluation processes described in the **Performance Measurement chapter,** and the quality control and risk management processes described in the **Project Management chapter** will ensure that that outputs and outcomes associated with stakeholder engagement are monitored and evaluated on an ongoing basis. Program risks associated with engagement efforts are identified in the **Project Management chapter.**

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IMPLEMENTATION PHASE REQUIREMENTS

MODERN TREATY OBLIGATIONS AND DUTY TO CONSULT WITH INDIGENOUS GROUPS

The Town of Bridgewater received confirmation through the Nova Scotia Office of Aboriginal Affairs that The Town is not required to consult with the First Nations in this province at the application stage of this project. The Town has consulted with Acadia First Nations based on Duty to Consult principles and as a good governance practice in accordance with the *Government of Nova Scotia Policy and Guidelines: Consultation with the Mi'kmaq of Nova Scotia*. The Town intends to undertake further consultation and build a partnership with Acadia First Nations regardless of the outcome of the application.

COMMUNITY EMPLOYMENT BENEFIT

The Town will be participating in the Community Employment Benefit Initiative. In order to do so, the Town will create a Community Employment Benefit policy to guide training, hiring, and procurement processes. The policy will result in a revision to our existing HR and Procurement Policies which do not yet include the principles of the Community Employment Benefit Initiative.

The Town will identify employment and procurement opportunities for three groups targeted by the initiative soon after the funding decision is made. Through feedback we received in consultation of residents and partner organizations, the Town is already aware of several groups who could be identified for employment and procurement opportunities.

No one individual can be held accountable, but we can hold a community accountable.
– RESIDENT, TOWN OF BRIDGEWATER

The Town will adhere to the following plan in the selection of the employment and procurement opportunities:

1. The Town will consult with community partners to come to a consensus on the needs of employment and procurement opportunities for the inclusion of those who are traditionally underrepresented.
2. A needs assessment will be undertaken to identify employment opportunities.
3. The town will develop partnerships for resident recruitment through partner organizations.
4. Measurable indicators will be created to monitor progress.
5. Dispute resolution mechanisms will be drafted.
6. A reporting framework will be created.

CLIMATE LENS ASSESSMENT

The Town of Bridgewater is not required to undertake a Climate Lens Assessment for the purposes of this application because we are in the $5 million prize category. Even so, a key focus of the Town's application is on a reduction in GHG emissions. The Town quantified and set targets for GHG emissions reductions of 80% by 2050 in our 2018 Community Energy Investment Plan (CEIP). The Plan provides guidance for many climate mitigating project outcomes and details their climate impacts. The Town was one of only two communities in Atlantic Canada who submitted to the Carbon Disclosure Project (CDP) in 2018 and received an overall score of B, higher than the regional and global averages.



Community stakeholders watching a presentation at a Smart Cities Challenge workshop.

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ATIA - 21(1)(b)

[redacted]

The project will draw on a wide array of partners and stakeholders who are working at the ground level on poverty reduction, transportation, and employment to identify opportunities for shared solutions.

– COMMUNITY SERVICES ORGANIZATION REPRESENTATIVE

OTHER APPLICABLE LAWS, REGULATIONS AND POLICIES

FEDERAL POLICY

- **Reaching Home: Canada's Homelessness Strategy** Bridgewater's proposed outcomes for the provision of affordable, secure housing is closely aligned with *Canada's Homelessness Strategy*. The Town will utilize Employment and Social Development Canada's Homeless Individuals and Families Information System (HIFIS) software as the data platform for our Coordinated Access system.

- **A Place to Call Home: Canada's National Housing Strategy (2018)** Our project aligns with the Government of Canada's National Housing Strategy with activities aimed at providing preventative actions for reducing homelessness, helping households to find suitable housing and ensuring housing remains affordable.

- **Opportunity for All: Canada's First Poverty Reduction Strategy (2017)** Our project aligns with the Government of Canada's commitment to reducing poverty by 50% by 2030. In many ways, the Town's Energy Poverty Reduction Program mirrors the approach being taken nationally but with a more specific focus on the energy element of poverty and a course of action that is meaningful, measurable and monitored.

PROVINCIAL LEGISLATION AND POLICY

- **Municipal Government Act** As a municipal unit will operate in accordance with legislation laid out in the Nova Scotia Municipal Government Act and related regulations.

- **Housing Act** The Town of Bridgewater will develop policies in accordance with the legislation.

- **Building Code Act** The Housing Energy Management System within the Energy Poverty Reduction Program will adhere, at minimum, to the requirements set out in the Act and related regulations.

- **Access by Design 2030 Achieving an Accessible Nova Scotia:** The Town is aligned with the Act's acknowledgement that accessibility is a human right and through our Mobility Improvement System.

- **The 2005 Environmental Goals and Sustainable Prosperity Act (EGSPA)** Our proposal aligns with goals on sustainable prosperity, such as emission reduction, energy efficiency programs, climate change adaptation and improving the Province's environment and economy for future generations.

- **Nova Scotia's Electricity Plan 2015-2040** Our conforms with key themes of Nova Scotia's Electricity Plan to ensure stable electricity prices for residents, create innovative energy systems that promote customer control, integrate systems, and increase the value of renewable energy resources in home heating and transportation.

- **A Housing Strategy for Nova Scotia (2013)** Our aligns with and supports the Province of Nova Scotia's goal to ensure that Nova Scotians can find the housing choice that's right for them and their families, at a price they can afford, in a healthy, vibrant community that offers the services, supports and opportunities they need.

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INTRODUCTION

For Bridgewater to lift 20% of its residents out of energy poverty in 10 years, $89.8 million dollars needs to be invested into the community. The $5 million prize of the Smart Cities Challenge is just a fraction of the overall cost but is the catalyst that will enable the Town to make this bold step forward to ensure no family is left behind. It is also an investment in the shift required to achieve a clean, efficient, affordable and secure energy future for our community.

By the end of the Smart Cities Challenge program in 2025, our community will have been the recipient of $45.7 million worth of investments in housing, transportation, community energy systems, and community services. As Table 9.1 indicates, that will increase by another $44.1 million over the next 5 years as the program matures through years 6-10. The large majority of these investments relate to 'hard' costs and come with financial returns (labeled "with ROI" in the tables and charts in this chapter). By undertaking strategic de-risking activities, and leveraging the power of connected technologies such as home energy monitoring systems, Bridgewater will be able to bundle these investment opportunities and make them attractive to a diverse group of investors. Pooled capital implements the energy poverty reduction solutions described in the previous chapters, which systematically lifts Bridgewater residents out of energy poverty. These capitalization activities are explained in detail later in this chapter.

To deliver on these opportunities, the Energy Poverty Reduction Program will incur $5.42 million in core operating costs over the first 5 years. These costs consist of program development, operations, and administration. They can be offset by the $5 million Smart Cities Challenge grant, which acts as a catalyst that allows the community to leverage the additional $40.3 million over that same timeframe, an investment leverage ratio of 1:8 for the grant. The remaining core operating cost can be achieved with an in-kind contribution of $420,000 from the Town of Bridgewater. As indicated in Table 9.2, 2.6% of the Smart Cities Challenge grant would be held in reserve as a contingency. If unused, this amount can help subsidize home energy improvements for program participants.

> Through our proposed solutions, we will make sure those among us who are most vulnerable and least able to afford the transition, are the first ones we help across the threshold. Those residents have the most to lose and through the betterment of their lives, our community has everything to gain. – MAYOR MITCHELL

Energy Poverty Reduction Program Total Costs by Activity for Each Program Year

Program	Activity	2020-21	2021-22	2022-23	2023-24	2024-25	Years 1-5 Total	Years 6-10 Total	Grand Total
Sub-Totals	Program Development	$1,295,000	$700,350	$128,778	$130,710		$2,254,838		$2,254,838
	Program Operations & Administration	$207,500	$624,225	$691,539	$750,274	$890,219	$3,163,756	$4,385,043	$7,548,799
	Capital Planning & Improvements- No ROI		$1,185,013	$1,452,617	$1,905,749	$2,366,841	$6,910,219	$14,693,023	$21,603,242
	Capital Planning & Improvements- With ROI		$1,731,945	$9,199,368	$11,015,163	$11,442,793	$33,389,270	$25,012,945	$58,402,215
	Total	$1,502,500	$4,241,533	$11,472,302	$13,801,896	$14,699,852	$45,718,084	$44,091,010	$89,809,094

Table 9.1

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Capitalization by System for Each Program Year

System	Capitalization by Program Year					
	2020-21	2021-22	2022-23	2023-24	2024-25	Total
Overall Program Management	$157,500	$139,563	$131,354	$133,324	$214,926	$776,666
Housing Energy Management System - Operations	$422,500	$406,000	$282,024	$305,861	$197,679	$1,614,064
Community Energy Systems	$387,500	$185,238	$43,785	$44,441	$45,108	$706,071
Mobility Improvement System	$83,750	$54,556	$14,166	$14,378	$14,594	$181,444
Investment System	$225,000	$274,050	$146,807	$162,080	$177,778	$985,716
Coordinated Access System	$120,000	$157,325	$92,720	$109,796	$127,364	$607,205
Contingency (2.6%)						$128,834
Total	$1,396,250	$1,216,731	$710,855	$769,881	$777,449	$5,000,000

Table 9.2

A detailed breakdown of all program costs, including the line items that make up the core operating costs, are described in detail in the tables that follow in this chapter.

FINANCIAL CONTROLS AND STANDARDS

The accounts of the Town of Bridgewater are kept and reported on in accordance with Generally Accepted Accounting Principles adopted for Nova Scotia Municipalities as defined in the Financial Reporting and Accounting Manual (FRAM) prescribed by the Minister of the Department of Municipal Affairs and as outlined in the Canadian Public Sector Accounting Standards. The Town undergoes an annual external audit by a Registered Municipal Auditor as defined in Section 457 of the Nova Scotia Municipal Government Act. The accounts for the Energy Poverty Reduction Program, as a program of the Town of Bridgewater, will adhere to these same financial controls and standards.

In accordance with municipal accounting principles, projected program expenditures by the Town of Bridgewater are inclusive of municipal net of HST. To account for general inflation, conservative cost escalation of 1.5% per year has been built into each year of the program, starting with 0% inflation in fiscal year 2020-21, and increasing by 1.5% per year, compounded annually.

COST OF SERVICES

COORDINATED ACCESS SYSTEM

Estimated service costs for the Coordinated Access System are presented in Table 9.3. Cost assumptions were developed in consultation with community partners who are familiar with the delivery and cost of community support services. In particular the local delivery of housing support services by Family Services of Western Nova Scotia was used as the basis of the Coordinated Access Service Provision. As the Homeless Individuals and Families Information System (HIFIS) is a free service, database set up costs relate to the design and programming of data entry templates and reports by program staff. Service costs to clients were calculated using an annual cost per client of approximately $600 per year, plus inflation. These services are projected to be delivered by 1.5FTE (full time equivalent) social workers for the first three years of the program, and by 2.0FTE social workers from 2023-24 onward. These program staff also account for the majority of the program design, partnership development and coordination, and program evaluation and improvement work. In-kind provision of office space has not been accounted for in this model, as we assume that service providers will be able to provide those needs.

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Cost of Services for Coordinated Access System

Program	Activity	Cost Type	2020-21	2021-22	2022-23	2023-24	2024-25	Years 1-5 Total	Years 6-10 Total	Grand Total
Partnership Coordination	Partnership development	Program Development	$20,000	$10,150				$30,150		$30,150
	Partner coordination	Program Operations & Administration		$10,150	$10,302	$10,457	$10,614	$41,523	$55,505	$97,027
	Program evaluation & improvement	Program Operations & Administration	$20,000	$20,300	$20,605	$20,914	$21,227	$103,045	$111,009	$214,054
Coordinated Access Service Provision	Detailed program design	Program Development	$50,000	$50,750				$100,750		$100,750
	Staff hiring & training	Program Development	$10,000	$10,150				$20,150		$20,150
	Database setup	Program Development	$10,000	$10,150				$20,150		$20,150
	Serve 2021-22 clients	Program Operations & Administration		$30,450				$30,450		$30,450
	Serve 2022-23 clients	Program Operations & Administration			$46,360			$46,360		$46,360
	Serve 2023-24 clients	Program Operations & Administration				$62,741		$62,741		$62,741
	Serve 2024-25 clients	Program Operations & Administration					$79,602	$79,602		$79,602
	Serve 2025-30 clients	Program Operations & Administration							$499,600	$499,600
	IT system maintenance	Program Operations & Administration		$5,075	$5,151	$5,228	$5,307	$20,761	$27,752	$48,514
	Communications & marketing	Program Operations & Administration	$10,000	$10,150	$10,302	$10,457		$51,523	$55,505	$107,027
Sub-Totals	Program Development		$90,000	$81,200				$171,200		**$171,200**
	Program Operations & Administration		$30,000	$76,125	$92,720	$109,769	$127,364	$436,005	$749,371	**$1,185,376**
	Total		$120,000	$157,325	$92,720	$109,769	$127,364	$607,205	$749,371	**$1,356,576**

Table 9.3

HOUSING ENERGY MANAGEMENT SYSTEM – FINANCIAL SUMMARY

Estimated service costs for the Housing Energy Management System are presented in Table 9.4. Cost assumptions were developed in consultation with community partners and with energy service providers including Efficiency Nova Scotia and Clean Foundation, who deliver related programs in the Bridgewater area. Data platform development and maintenance costs were assumed to involve the development of the main components of the Municipal Enterprise Resource Planning platform and the Energy Management Information System (EMIS), and calculated based on market information from Bridgewater's current Municipal Enterprise Resource Planning provider, TownSuite, and from industry sources. Technical navigation services for clients and service and supplier procurement and coordination costs are calculated at $500 and $250 per client per year, respectively, plus inflation. These services are projected to be delivered by 2.0FTE (full time equivalent) technical staff plus 1.0FTE information technology staff. These program staff also account for the majority of the program design, partnership development and coordination, community engagement, program administration, and program evaluation and improvement work, and provide a share of their services to the other program service areas. Capital planning and improvement costs for housing retrofits and new construction are detailed in Tables 9.4, 9.5, 9.6, and 9.7.

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Housing Energy Management System

Sub-Program	Activity	Cost Type	2020-21	2021-22	2022-23	2023-24	2024-25	Years 1-5 Total	Years 6-10 Total	Grand Total
Program Coordination & Administration	Partnership development	Program Development	$30,000	$20,300				$50,300		$50,300
	Partner coordination	Program Operations & Administration		$10,150	$10,302	$10,457	$10,614	$41,523	$55,505	$97,027
	Staff hiring & training	Program Development	$20,000					$20,000		$20,000
	Technical navigation services for clients	Program Operations & Administration		$25,375	$38,633	$52,284	$66,335	$182,628	$416,334	$598,961
	Detailed program design	Program Development	$100,000	$50,750				$150,750		$150,750
	Database setup - municipal enterprise resource planning (ERP) system	Program Development	$75,000	$76,125				$151,125		$151,125
	Database setup - energy management information system (EMIS)	Program Development	$125,000	$126,875	$128,778	$130,710		$511,363		$511,363
	IT system maintenance	Program Operations & Administration	$40,000	$40,600	$41,209	$41,827	$42,455	$206,091	$222,018	$428,109
	Service & supplier procurement & coordination	Program Operations & Administration		$12,688	$19,317	$26,142	$33,168	$91,314	$208,167	$299,481
	Community engagement	Program Operations & Administration	$10,000	$10,150	$10,302	$10,457	$10,614	$51,523	$55,505	$107,027
	Program administration	Program Operations & Administration	$10,000	$20,300	$20,605	$20,914	$21,227	$93,045	$111,009	$204,054
	Program evaluation & improvement	Program Operations & Administration	$20,000	$20,300	$20,605	$20,914	$21,227	$103,045	$111,009	$214,054
	Communications & marketing	Program Operations & Administration	$20,000	$20,300	$20,605	$20,914	$21,227	$103,045	$111,009	$214,054
Housing Retrofits	Plan and implement 2021-22 home retrofits			$2,434,427				$2,434,427		$2,434,427
	Capital Planning & Improvements- No ROI			$844,988				$844,988		$844,988
	Capital Planning & Improvements- With ROI			$1,589,439				$1,589,439		$1,589,439
	Plan and implement 2022-23 home retrofits				$3,701,176			$3,701,176		$3,701,176
	Capital Planning & Improvements- No ROI				$1,296,023			$1,296,023		$1,296,023
	Capital Planning & Improvements- With ROI				$2,405,153			$2,405,153		$2,405,153

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$ FINANCIAL

Sub-Program	Activity	Cost Type	2020-21	2021-22	2022-23	2023-24	2024-25	Years 1-5 Total	Years 6-10 Total	Grand Total
Housing Retrofits	Plan and implement 2023-24 home retrofits					$4,947,188		$4,947,188		$4,947,188
	Capital Planning & Improvements-No ROI					$1,760,400		$1,760,400		$1,760,400
	Capital Planning & Improvements-With ROI					$3,186,789		$3,186,789		$3,186,789
	Plan and implement 2024-25 home retrofits						$6,373,615	$6,373,615		$6,373,615
	Capital Planning & Improvements-No ROI						$2,238,416	$2,238,416		$2,238,416
	Capital Planning & Improvements-With ROI						$4,135,200	$4,135,200		$4,135,200
	Plan and implement 2025-30 home retrofits								$37,089,975	$37,089,975
	Capital Planning & Improvements-No ROI								$14,006,937	$14,006,937
	Capital Planning & Improvements-With ROI								$23,083,038	$23,083,038
New Construction	Plan and implement 2021-22 home retrofits			$127,281				$127,281		$127,281
	Capital Planning & Improvements-No ROI			$5,075				$5,075		$5,075
	Capital Planning & Improvements-With ROI			$122,206				$122,206		$122,206
	Plan and implement 2022-23 home retrofits				$180,866			$180,866		$180,866
	Capital Planning & Improvements-No ROI				$7,212			$7,212		$7,212
	Capital Planning & Improvements-With ROI				$173,655			$173,655		$173,655
	Plan and implement 2023-24 home retrofits					$236,031		$236,031		$236,031
	Capital Planning & Improvements-No ROI					$9,411		$9,411		$9,411
	Capital Planning & Improvements-With ROI					$226,619		$226,619		$226,619

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$ FINANCIAL

Sub-Program	Activity	Cost Type	2020-21	2021-22	2022-23	2023-24	2024-25	Years 1-5 Total	Years 6-10 Total	Grand Total
New Construction	Plan and implement 2024-25 home retrofits						$292,809	$292,809		$292,809
	Capital Planning & Improvements- No ROI						$11,675	$11,675		$11,675
	Capital Planning & Improvements- With ROI						$281,134	$281,134		$281,134
	Plan and implement 2025-30 home retrofits								$1,894,434	$1,894,434
	Capital Planning & Improvements- No ROI								$75,536	$75,536
	Capital Planning & Improvements- With ROI								$1,818,898	$1,818,898
Sub-Totals	Program Development		$350,000	$274,050	$128,778	$130,710		$883,538		**$883,538**
	Program Operations & Administration		$100,000	$159,863	$181,577	$203,907	$226,866	$872,213	$1,290,555	**$2,162,768**
	Capital Planning & Improvements- No ROI			$850,063	$1,303,235	$1,769,811	$2,250,091	$6,173,199	$14,082,473	**$20,255,671**
	Capital Planning & Improvements- With ROI			$1,711,645	$2,578,808	$3,413,408	$4,416,334	$12,120,195	$24,901,936	**$37,022,130**
	Total		$450,000	$2,995,620	$4,192,398	$5,517,836	$6,893,291	$20,049,144	$40,274,964	**$60,324,108**

Table 9.4



A heat pump condenser on the side of a home.

HOUSING ENERGY MANAGEMENT SYSTEM – HOUSING RETROFITS

Table 9.5 provides the estimated breakdown of the 318 target homes to be served through the Housing Retrofit program. Homes are divided into 13 common 'archetypes', defined by the combination of building form, sub-type, age, and type of heating system. Archetypes are defined in detail in Bridgewater's Community Energy Investment Plan. The combination of archetypes represents as closely as possible the housing type distribution of Bridgewater households who reported living in energy poverty in a community-wide survey issued early in 2019. Actual participation rates may vary from this distribution, depending on program enrolment.

Social investing is giving both the community and traditional investors a choice to invest in social outcomes that are of interest to them.

– COMMUNITY SERVICE ORGANIZATION

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Number of Retrofits by Housing Archetype for each Program Year

Year			2020-21		2021-22		2022-23		2023-24		2024-25		Years 1-5 Total	Years 6-10 Total	Grand Total
Form	Type	Age	Electric	Oil	Electric	Oil	Electric	Oil	Electric	Oil	Electric	Oil			
Multi Unit	converted	new	0	0	1	1	2	2	3	2	3	3	17	35	52
Multi Unit	converted	old	0	0	0	0	1		2	2	1	1	7	20	27
Multi Unit	purposebuilt	new	0	0	2	2	3	3	4	4	5	6	29	55	84
Multi Unit	purposebuilt	old	0	0	1	2	3	2	3	3	4	4	22	46	68
Semi Detached	large	new	0	0	1	1	1	1	1	2	2	2	11	26	37
Single Detached	small high	new	0	0	2	2	3	3	4	4	5	5	28	60	88
Single Detached	small high	old	0	0	1	2	2	2	3	2	4	3	19	40	59
Single Detached	medium low	new	0	0	2	3	3	4	5	4	6	6	33	70	103
Single Detached	medium high	new	0	0	3	2	4	4	5	5	7	6	36	76	112
Single Detached	medium high	old	0	0	1	1	1	1	2	1	2	2	11	26	37
Single Detached	large low	new	0	0	3	3	5	4	5	6	7	7	40	83	123
Single Detached	small low	new	0	0	1	1	2	2	3	1	3	3	17	40	57
Mobile	N/A	N/A	0	0	4	3	5	5	7	7	8	9	48	105	153
Total			0		45		68		91		114		318	682	1000

Table 9.5

Table 9.6 provides a breakdown of the capital planning and improvement costs for the 318 homes that are projected to enroll in the Housing Retrofit program. Unit costs for most line items, including those with and without any financial return on investment (ROI) were estimated based on existing housing retrofit programs including the Clean Energy Financing, Clean Net Zero, and HomeWarming programs. Smart thermostat, smart submeter, and home energy dashboard costs were estimated by energy consulting firm Green Power Labs.



An old Bridgewater home converted into a multi-unit residential apartment building.

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Cost of Services for Retrofit Activities by Program Year

Retrofit Activity	Cost Type	2020-21	2021-22	2022-23	2023-24	2024-25	Years 1-5 Total	Years 6-10 Total	Grand Total
Assessment & Planning	No financial ROI		$228,375	$350,277	$475,784	$604,977	$1,659,412	$3,785,659	$5,445,071
Contractor Administration	No financial ROI		$114,188	$175,138	$237,892	$302,489	$829,706	$1,892,829	$2,722,536
Temporary Displacement Cost	No financial ROI		$45,675	$70,055	$95,157	$120,995	$331,882	$757,132	$1,089,014
Deferred Maintenance Costs	No financial ROI		$456,750	$700,553	$951,567	$1,209,954	$3,318,825	$7,571,317	$10,890,142
Lighting	With financial ROI		$3,654	$5,604	$7,613	$9,680	$26,551	$54,354	$80,905
Appliances	With financial ROI		$91,350	$140,111	$190,313	$241,991	$663,765	$1,358,851	$2,022,616
Deep Retrofit - Thermal	With financial ROI		$616,460	$942,810	$1,238,920	$1,613,273	$4,411,463	$8,998,855	$13,410,318
Solar Domestic Hot Water	With financial ROI		$159,863	$245,194	$333,049	$423,484	$1,161,589	$2,377,989	$3,539,577
Solar Photovoltaic	With financial ROI		$635,390	$945,747	$1,247,494	$1,629,193	$4,457,824	$9,040,649	$13,498,473
Smart Thermostat	With financial ROI		$59,885	$90,660	$121,822	$157,082	$429,448	$902,636	$1,332,085
Smart Submeter + Home Energy Dashboard	With financial ROI		$22,838	$35,028	$47,578	$60,498	$165,941	$349,703	$515,645
Total			$2,434,427	$3,701,176	$4,947,188	$6,373,615	$17,456,406	$37,089,975	$54,546,381

Table 9.6

Number of Newly Constructed Homes by Housing Archetype for each Program Year

Year	2020-21	2021-22	2022-23	2023-24	2024-25	Years 1-5 Total	Years 6-10 Total	Grand Total
New Construction - Row Homes	0	5	7	9	11	32	68	100

Table 9.7

My experience right now, our home is not fit for anyone to be in, I have two small children who live there, my kids are sick non-stop, and we can't afford to move.

– BRIDGEWATER RESIDENT

HOUSING ENERGY MANAGEMENT SYSTEM – NEW CONSTRUCTION

Table 9.7 provides the estimated breakdown of the 32 target homes to be served through the New Construction program. Homes are estimated to uniformly be row homes. Actual participation rates may vary from this distribution, depending on program enrolment.

Table 9.8 provides a breakdown of the capital planning and improvement costs for the 32 homes that are projected to enroll in the New Construction program. Unit costs for line items are incremental costs above the cost of construction to building code. Sources of cost information is the same as for the Housing Retrofit program.

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Cost of Services for New Construction Activities by Program Year

New Construction Activity	Cost Type	2020-21	2021-22	2022-23	2023-24	2024-25	Years 1-5 Total	Years 6-10 Total	Grand Total
Assessment & Planning	No financial ROI		$5,075	$7,212	$9,411	$11,675	$33,373	$75,536	$108,908
Incremental Cost increase - Lighting	With financial ROI		$406	$577	$753	$934	$2,670	$6,043	$8,713
Incremental Cost increase - Appliances	With financial ROI		$10,150	$14,423	$18,822	$23,350	$66,745	$151,071	$217,817
Incremental Cost increase - Envelope - Thermal	With financial ROI		$50,750	$72,116	$94,111	$116,750	$333,727	$755,356	$1,089,083
Incremental Cost increase - Solar Domestic Hot Water	With financial ROI		$17,763	$25,241	$32,939	$40,862	$116,804	$264,375	$381,179
Incremental Cost increase - Solar Photovoltaic	With financial ROI		$35,525	$50,481	$65,878	$81,725	$233,609	$528,749	$762,358
Incremental Cost increase - Smart Thermostat	With financial ROI		$5,075	$7,212	$9,411	$11,675	$33,373	$75,536	$108,908
Incremental Cost increase - Smart Submeter + Home Energy Dashboard	With financial ROI		$2,538	$3,606	$4,706	$5,837	$16,686	$37,768	$54,454
Total			$127,281	$180,866	$236,031	$292,809	$836,987	$1,894,434	$2,731,421

Table 9.8

COMMUNITY ENERGY SYSTEMS

Estimated service costs for the Community Energy Systems are presented in Table 9.9. Cost assumptions were developed in consultation with energy development consultants, in particular engineering consultants Roswall Inc. Costs are 100% external to the organization – no staffing is included in these figures as program staffing that supports this service is in part already included through the Technical Navigator positions, and in part is discounted from the cost model. Data platform development and maintenance costs were assumed to be incremental to development of the main Municipal Enterprise Resource Planning platform and the Energy Management Information System (EMIS), and calculated based on market information from Bridgewater's current Municipal Enterprise Resource Planning provider, TownSuite, and from industry sources. Construction of the 6MW of solar garden capacity was costed at $2.20, $2.00, and $1.80 per installed watt for 2022-23, 2023-24, and 2024-25 respectively, inflated according to the number of years past 2020-21.

MOBILITY IMPROVEMENT SYSTEM

Estimated service costs for the Mobility Improvement System are presented in Table 9.10. Cost assumptions were developed in consultation with Town of Bridgewater public transit and active transportation planning, engineering, and operations staff. Data platform development and maintenance costs were assumed to be incremental to development of the main Municipal Enterprise Resource Planning platform and the Energy Management Information System (EMIS), and calculated based on market information from Bridgewater's current Municipal Enterprise Resource Planning provider, TownSuite, and from industry sources. Program design, partnership development, community engagement, program administration, and program evaluation and marketing services are projected to be delivered by 0.25FTE (full time equivalent) transportation planning staff. Capital planning and improvement costs for public transit improvements are based on current operating data, and costs for active transportation improvements are based on current infrastructure construction costs.

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Cost of Services for Community Energy Systems by Sub-Program for each Program Year

Sub-Program	Activity	Cost Type	2020-21	2021-22	2022-23	2023-24	2024-25	Years 1-5 Total	Years 6-10 Total	Grand Total
Utility Grade Service Provision	Community-wide energy generation feasibility study	Program Development	$175,000					$175,000		$175,000
	Municipal utility detailed service design	Program Development	$100,000					$100,000		$100,000
	Municipal utility setup and/or service procurement	Program Development	$50,000	$101,500				$151,500		$151,500
	Legislative & regulatory approval process	Program Development	$20,000	$20,300				$40,300		$40,300
	Database setup	Program Development	$50,000	$20,300				$70,300		$70,300
	Utility grade service management	Program Operations & Administration		$50,750	$51,511	$52,284	$53,068	$207,613	$277,523	$485,136
Solar Garden Development	Conceptual design	Capital Planning & Improvements- No ROI		$65,975				$65,975		$65,975
	Fundraising & financing	Capital Planning & Improvements- No ROI		$20,300	$20,605	$20,914		$61,818		$61,818
	Community consultation	Capital Planning & Improvements- No ROI		$15,225	$15,453			$30,678		$30,678
	Detailed engineering design	Capital Planning & Improvements- No ROI		$101,500				$101,500		$101,500
	Procurement	Capital Planning & Improvements- No ROI		$20,300				$20,300		$20,300
	Permitting	Capital Planning & Improvements- With ROI		$20,300	$20,605			$40,905		$40,905
	Construction	Capital Planning & Improvements- With ROI			$6,522,689	$7,523,330	$6,872,561	$20,918,580		$20,918,580
	Database & IT systems setup	Capital Planning & Improvements- With ROI			$77,267	$78,426	$79,602	$235,295		$235,295
	Commissioning	Capital Planning & Improvements- With ROI					$53,068	$53,068		$53,068
	Operation & Maintenance	Capital Planning & Improvements- With ROI					$21,227	$21,227	$111,009	$132,236
Sub-Totals	**Program Development**		$395,000	$142,100				$537,100		**$537,100**
	Program Operations & Administration			$50,750	$51,511	$52,284	$53,068	$207,613	$277,523	**$485,136**
	Capital Planning & Improvements- No ROI			$223,300	$36,058	$20,914		$280,271		**$280,271**
	Capital Planning & Improvements- With ROI			$20,300	$6,620,561	$7,601,756	$7,026,459	$21,269,075	$111,009	**$21,380,084**
	Total		$395,000	$436,450	$6,708,130	$7,674,953	$7,079,527	$22,294,060	$388,532	**$22,682,592**

Table 9.9

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Cost of Services for Mobility Improvement System by Sub-Program for each Program Year

Sub-Program	Activity	Cost Type	2020-21	2021-22	2022-23	2023-24	2024-25	Years 1-5 Total	Years 6-10 Total	Grand Total
Program Coordination & Administration	Detailed program design	Program Development	$20,000	$20,300				$40,300		$40,300
	Partnership development	Program Development	$10,000					$10,000		$10,000
	Database setup	Program Development	$50,000	$20,300				$70,300		$70,300
	IT system maintenance	Program Operations & Administration		$10,150	$10,302	$10,457	$10,614	$41,523	$55,505	$97,027
	Community engagement	Program Operations & Administration	$5,000	$5,075	$5,151	$5,228	$5,307	$25,761	$27,752	$53,514
	Program administration	Program Operations & Administration	$2,500	$2,538	$2,576	$2,614	$2,653	$12,881	$13,876	$26,757
	Communications & marketing	Program Operations & Administration	$5,000	$5,075	$5,151	$5,228	$5,307	$25,761	$27,752	$53,514
	Program evaluation & improvement	Program Operations & Administration	$10,000	$10,150	$10,302	$10,457	$10,614	$51,523	$55,505	$107,027
Transit System Improvements	Plan and implement 2021-22 transit improvements	Capital Planning & Improvements- No ROI		$20,300				$20,300		$20,300
	Plan and implement 2022-23 transit improvements	Capital Planning & Improvements- No ROI			$20,605			$20,605		$20,605
	Plan and implement 2023-24 transit improvements	Capital Planning & Improvements- No ROI				$20,914		$20,914		$20,914
	Plan and implement 2024-25 transit improvements	Capital Planning & Improvements- No ROI					$21,227	$21,227		$21,227
	Plan and implement 2025-30 transit improvements	Capital Planning & Improvements- No ROI							$111,009	$111,009
Active Transportation Improvements	Plan and implement 2021-22 AT improvements	Capital Planning & Improvements- No ROI		$91,350				$91,350		$91,350
	Plan and implement 2022-23 AT improvements	Capital Planning & Improvements- No ROI			$92,720			$92,720		$92,720
	Plan and implement 2023-24 AT improvements	Capital Planning & Improvements- No ROI				$94,111		$94,111		$94,111
	Plan and implement 2024-25 AT improvements	Capital Planning & Improvements- No ROI					$95,523	$95,523		$95,523
	Plan and implement 2025-30 AT improvements	Capital Planning & Improvements- No ROI							$499,541	$499,541
Sub-Totals	**Program Development**		$80,000	$40,600				$120,600		**$120,600**
	Program Operations & Administration		$22,500	$32,988	$33,482	$33,985	$34,494	$157,449	$180,390	**$337,838**
	Capital Planning & Improvements- No ROI			$111,650	$113,325	$115,025	$116,750	$456,749	$610,550	**$1,067,299**
	Total		$102,500	$185,238	$146,807	$149,009	$151,244	$734,798	$790,940	**$1,525,738**

Table 9.10

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$ FINANCIAL

Cost of Services for Investment System by Sub-Program for each Program Year

Sub-Program	Activity	Cost Type	2020-21	2021-22	2022-23	2023-24	2024-25	Years 1-5 Total	Years 6-10 Total	Grand Total
Municipal Capitalization System	Detailed program design	Program Development	$50,000	$50,750				$100,750		$100,750
	Database setup	Program Development	$50,000	$20,300				$70,300		$70,300
	Staff hiring & training	Program Development	$10,000					$10,000		$10,000
	Partnership development	Program Development	$20,000	$20,300				$40,300		$40,300
	Project financial planning	Program Operations & Administration	$30,000	$30,450	$30,907	$31,370	$31,841	$154,568	$166,514	$321,082
	Plan, confirm, and administer 2021-22 funding	Program Operations & Administration		$35,525				$35,525		$35,525
	Plan, confirm, and administer 2022-23 funding	Program Operations & Administration			$36,058			$36,058		$36,058
	Plan, confirm, and administer 2023-24 funding	Program Operations & Administration				$36,599		$36,599		$36,599
	Plan, confirm, and administer 2024-25 funding	Program Operations & Administration					$37,148	$37,148		$37,148
	Plan, confirm, and administer 2025-30 funding	Program Operations & Administration							$194,266	$194,266
	Reporting to funders	Program Operations & Administration		$15,225	$15,453	$15,685	$15,920	$62,284	$83,257	$145,541
	IT system maintenance	Program Operations & Administration		$10,150	$10,302	$10,457	$10,614	$41,523	$55,505	$97,027
	Program evaluation & improvement	Program Operations & Administration	$10,000	$10,150	$10,302	$10,457	$10,614	$51,523	$55,505	$107,027
Financial Investment Vehicle	Investment vehicle organization creation and/or service procurement	Program Development	$50,000	$50,750				$100,750		$100,750
	Administration & Reporting	Program Operations & Administration	$15,000	$15,225	$15,453	$15,685	$15,920	$77,284	$83,257	$160,541
	Plan, sell, and administer investment raise 2021-22	Program Operations & Administration		$25,375				$25,375		$25,375
	Plan, sell, and administer investment raise 2022-23	Program Operations & Administration			$38,633			$38,633		$38,633
	Plan, sell, and administer investment raise 2023-24	Program Operations & Administration				$52,284		$52,284		$52,284
	Plan, sell, and administer investment raise 2024-25	Program Operations & Administration					$66,335	$66,335		$66,335
	Plan, sell, and administer investment raises 2025-30	Program Operations & Administration							$416,334	$416,334
Sub-Totals	**Program Development**		$180,000	$142,100				$322,100		**$322,100**
	Program Operations & Administration		$55,000	$142,100	$157,109	$172,537	$188,392	$715,138	$1,054,636	**$1,769,774**
	Total		$235,000	$284,200	$157,109	$172,537	$188,392	$1,037,238	$1,054,636	**$2,091,874**

Table 9.11

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INVESTMENT SYSTEM

Estimated service costs for the Investment System are presented in Table 9.11. Cost assumptions were developed in consultation with investment industry experts and investment platform providers including Tapestry Community Capital and MaRS Centre for Social Innovation. Data platform development and maintenance costs were assumed to be incremental to development of the main Municipal Enterprise Resource Planning platform and the Energy Management Information System (EMIS), and calculated based on market information from Bridgewater's current Municipal Enterprise Resource Planning provider, TownSuite, and from industry sources. Program design, partnership development, project financial planning, funding efforts, reporting to funders, and program evaluation and improvement are projected to be delivered by 1.0FTE (full time equivalent) financial staff.

OVERALL PROGRAM MANAGEMENT

Estimated service costs for Overall Program Management are presented in Table 9.12. Cost assumptions were developed based on prior experience with program design and management. Program governance, management, risk management and quality control, and performance measurement and evaluation are projected to be delivered by 1.5FTE (full time equivalent) program staff.

Cost of Services for Overall Program Management by Sub-Program for each Program Year

Sub-Program	Activity	Cost Type	2020-21	2021-22	2022-23	2023-24	2024-25	Years 1-5 Total	Years 6-10 Total	Grand Total
Program Governance, Management, and Evaluation	Program governance setup	Program Development	$50,000					$50,000		$50,000
	Program governance	Program Operations & Administration		$20,300	$20,605	$20,914	$21,227	$83,045	$111,009	$194,054
	Program management setup	Program Development	$50,000					$50,000		$50,000
	Program management	Program Operations & Administration		$50,750	$51,511	$52,284	$53,068	$207,613	$277,523	$485,136
	Program risk management & quality control setup	Program Development	$50,000					$50,000		$50,000
	Program risk management & quality control	Program Operations & Administration		$50,750	$51,511	$52,284	$53,068	$207,613	$277,523	$485,136
	Phase 1 performance measurement & evaluation	Program Development	$50,000	$20,300				$70,300		$70,300
	Phase 2 performance measurement & evaluation	Program Operations & Administration		$40,600	$51,511	$52,284		$144,395		$144,395
	Phase 3 performance measurement & evaluation	Program Operations & Administration					$132,670	$132,670		$132,670
	Phase 4 performance measurement & evaluation	Program Operations & Administration							$166,574	$166,574
Sub-Totals	**Program Development**		$200,000	$20,300				$220,300		**$220,300**
	Program Operations & Administration			$162,400	$175,138	$177,765	$260,034	$775,338	$832,568	**$1,607,906**
	Total		$200,000	$182,700	$175,138	$177,765	$260,034	$995,638	$832,568	**$1,828,206**

Table 9.12

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CAPITALIZATION OF SERVICES

CAPITALIZATION BY SOURCE

Service capitalization is projected to be achieved from three distinct funding streams:

1. **No investor:** non-debt and non-grant revenues consist of user fees and in-kind or donated services, material, and labour. User fees apply to the Housing Energy Management System and represent a combination of property owner up-front investment into their own property, and payment of administration fees to sustain program operations. User-pay ratios for home energy improvement programs in Nova Scotia range from 0% (HomeWarming Program) to around 50% (Clean Net Zero) with the majority of energy retrofits programs capitalizing upwards of 80% of program costs. However, there are no existing programs that provide greater than $20,000 in financing or funding for single family homes, and only limited program dollars for multi-unit buildings. User fees apply to the Investment System as administration fees can be leveraged on investment raises. In-kind material and services can be expected for the Coordinated Access System and Housing Energy Management System as there is ample opportunity to fundraise for these services within the local community.

> People have to make difficult decisions about what to pay, phone, energy bill, arrears, there is difficulty about what to pay for at each point in time, which is compounded in the winter, it impacts their social well-being and mental health.
>
> – COMMUNITY SERVICE ORGANIZATION

2. **Financial investor:** capital raises from investors that require dividends or interest to be generated from their investments, which means that financed activities must generate a positive return on investment (ROI). ROIs apply to community energy systems and ROI components of housing retrofits and new construction. Overall program management may need to charge an administrative fee to cover expenses once Program Maturity (Phase 4) is reached. Financial investors also includes energy performance contractors.
3. **Specialized investor:** funding from organizations that do not expect a financial return on their investment and instead expect to achieve social impact or other public benefit. Includes issuers of loan guarantees, provincial energy rebates and incentives, philanthropic charitable and non-profit funding, Provincial and Federal government funding including the Smart Cities Challenge, and municipal funding and in-kind contributions.





A Bridgewater resident views an exhibit on energy poverty at a Smart Cities Challenge Open House.

Capitalization projections by service area are provided in Table 9.13. Projections are separated into years 1-5 (within the Smart Cities Challenge timeframe) and years 6-10 (Program Maturity). Further explanations on capitalizations projections by program service are provided in the following sections.

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Capitalization by Source

Capitalization Source		Coordinated Access System		Housing Energy Management System		Community Energy Systems		Mobility Improvement System		Investment System		Overall Program Management		Total	
		Years 1-5	Years 6-10	Years 1-5	Years 6-10	Years 1-5	Years 6-10	Years 1-5	Years 6-10	Years 1-5	Years 6-10	Years 1-5	Years 6-10	Years 1-5	Years 6-10
No investor (direct cost recovery)	User fees	0%	0%	14%	15%	0%	0%	0%	0%	0%	47%	0%	0%	6%	15%
	In-kind or donated services, material and labour	0%	25%	5%	5%	0%	0%	0%	0%	0%	0%	0%	0%	2%	5%
Financial investor expecting full financial ROI	Financial investors	0%	0%	25%	25%	95%	89%	0%	0%	0%	0%	0%	36%	57%	24%
Specialized investor not expecting financial ROI	Loan guarantees & forgivable loans	0%	0%	3%	3%	0%	0%	0%	0%	0%	0%	0%	0%	1%	3%
	Provincial energy rebates	0%	0%	18%	21%	0%	0%	0%	0%	0%	0%	0%	0%	8%	19%
	Philanthropic, charitable, and non-profit funding	0%	25%	0%	1%	0%	0%	0%	0%	0%	0%	0%	18%	0%	1%
	Smart Cities Challenge	100%	0%	9%	0%	3%	0%	25%	0%	95%	0%	78%	0%	11%	0%
	Provincial/Federal government funding	0%	50%	26%	30%	1%	0%	22%	38%	0%	47%	0%	18%	12%	30%
	Municipal funding & in-kind	0%	0%	1%	0%	0%	11%	54%	62%	5%	5%	22%	28%	2%	2%
Total		100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Table 9.13

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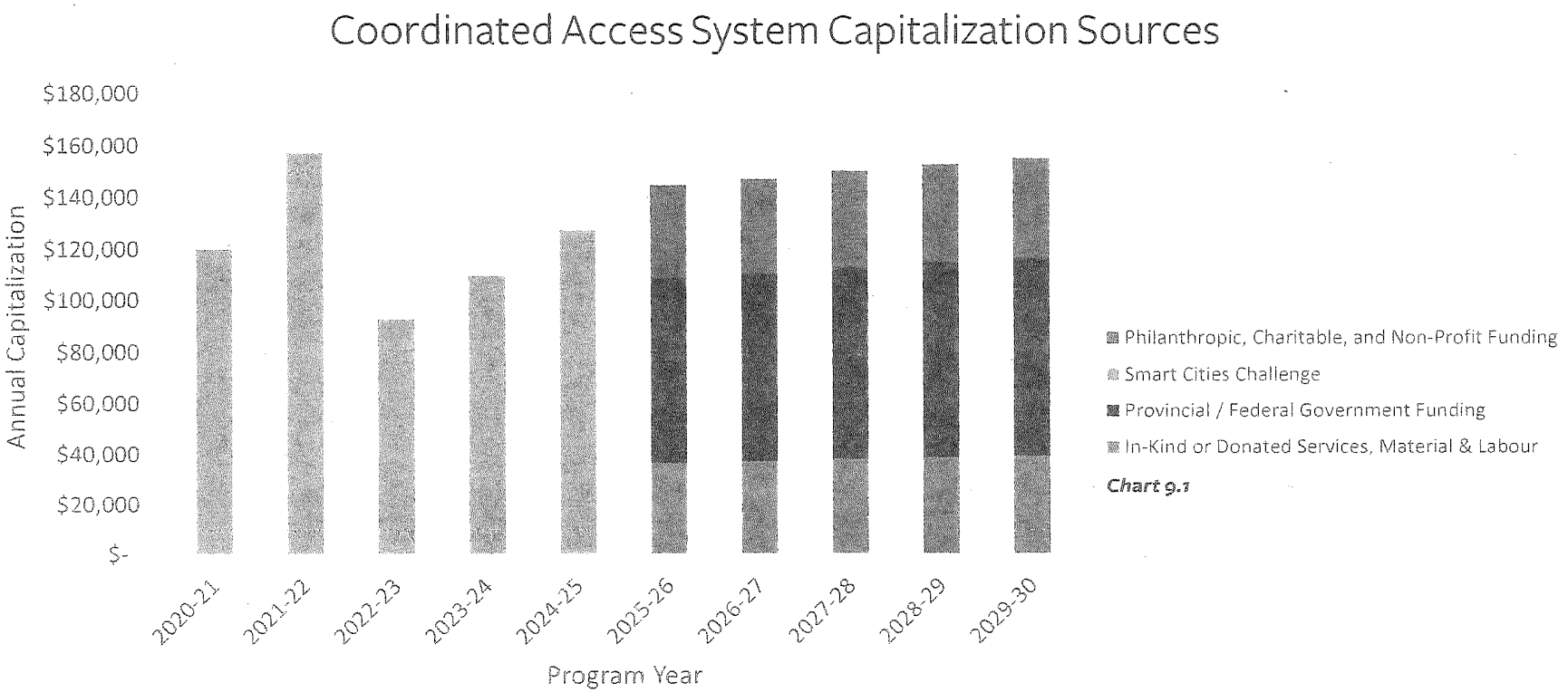


Chart 9.1

As seen in Chart 9.1, we propose that the Coordinated Access System receive 100% of its development and operating funding from the Smart Cities Challenge grant in years 1-5. This amounts to $607,205. This allows the program to be designed and prototyped with little to no financial risk to it, thereby allowing it to demonstrate its value to the community and to other funders, while protecting services for its clients for a 5-year duration. After the Smart Cities Challenge timeframe, service funding would be expected from in-kind or donated services (25%), senior government grant funding (50%) and philanthropic or charitable funding (25%). As a community service with no own-source revenue potential, government and charitable funding would be required to sustain the service over the long term. Our proposition is that the public benefit conferred by the service in saved health care, protective services, legal, and social service costs through mitigated social harms would far outweigh the cost of funding the service, thereby supporting this social investment on rational macroeconomic grounds.

So much money can be saved upfront by providing coordinated access to service

– COMMUNITY SERVICE ORGANIZATION

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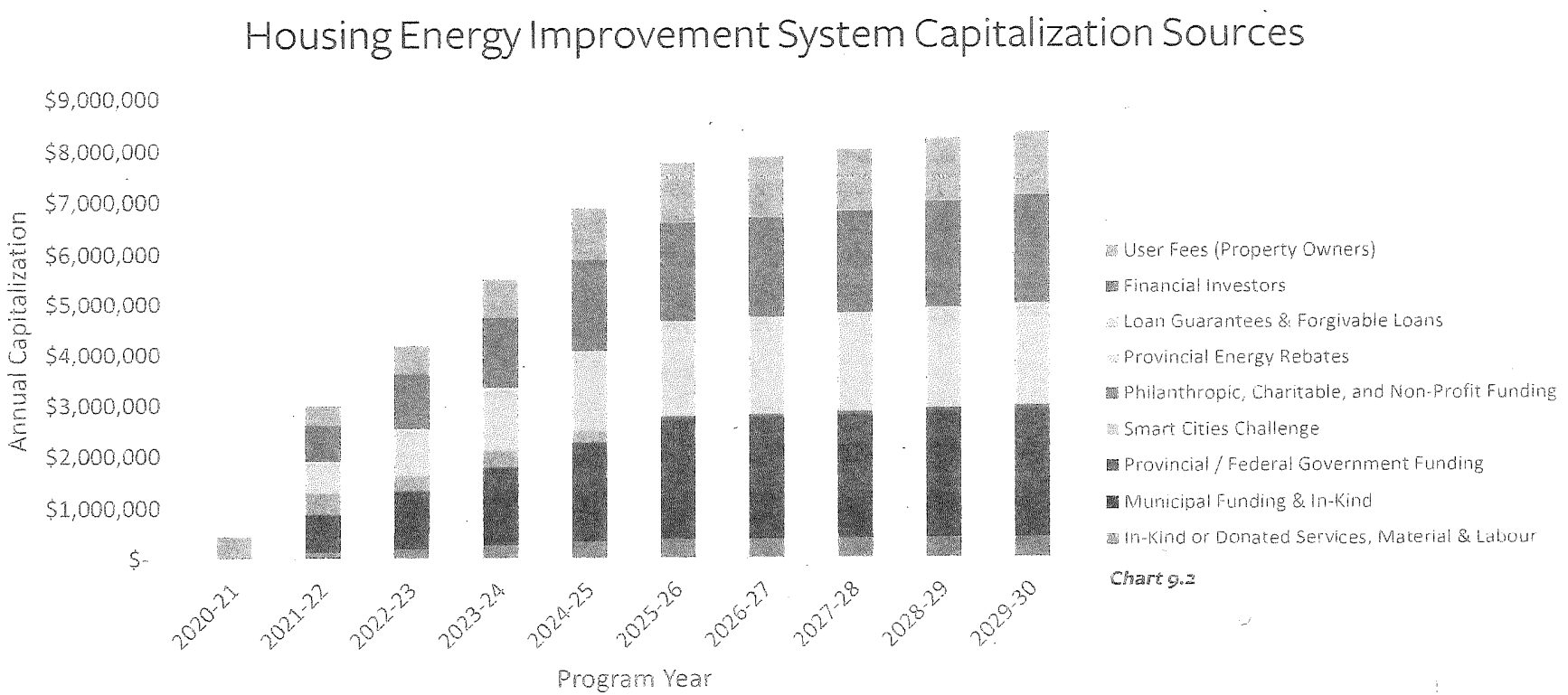


Chart 9.2

As seen in Chart 9.2, we propose that the Housing Energy Improvement System receive its development and operating funding from the Smart Cities Challenge grant in years 1-5. This amounts to $1,614,064 and represents the most substantial use of the grant, with a large focus on data platform development. Starting in year 2 (2021-22), early prototyping begins with participating property owners, enabling the stacking of other funding and financing sources.

The service is able to make use of a blend of financial investments and specialized funding, which accounts for its unique capitalization potential. Substantial specialized funding exists to support the program, in the form of energy efficiency rebates from Efficiency Nova Scotia and solar install rebates from the Province (modelled at a conservative total of $10,000 per participating home). The Province also provides specialized funding for deferred maintenance improvements to low income homes, and capitalizes improvements to Housing Nova Scotia's public housing stock, unit costs for which are included in this calculation. Financial investors are projected to find favourable investment opportunities by contributing around 25% of the capital improvements that create a direct return on investment. Accounting for some allowance for forgivable loans, loan guarantees, and in-kind funding through community fundraising for low-income housing improvements, the remaining 15% of capital is projected

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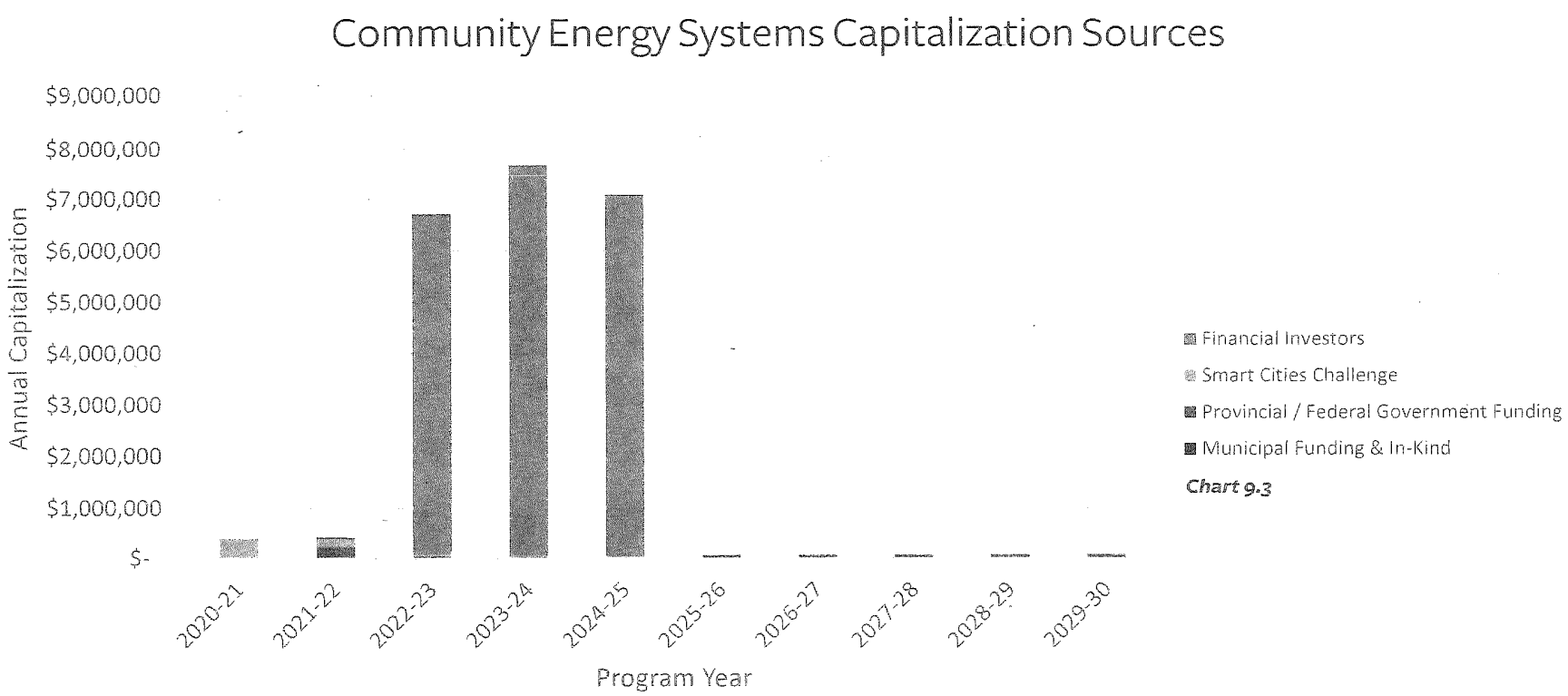


Chart 9.3

to come from property owners as a combination of own funds and administrative fees. After the Smart Cities Challenge timeframe, service capitalization ratios would be expected continue as before, but without the Smart Cities grant.

As seen in Chart 9.3, we propose that the Community Energy Systems receive its development and operating funding from the Smart Cities Challenge grant in years 1-5. This amounts to $706,071. Additional de-risking funds are projected to come from senior levels of government, which have already funded Bridgewater's community energy initiatives and have indicated continued interest in doing so. Other than some municipal in-kind contribution for program administration, 100% of remaining capital would be sourced from financial investors who could receive ongoing interest payments and/or dividends on their energy investment.



Smart Cities Challenge Open House.

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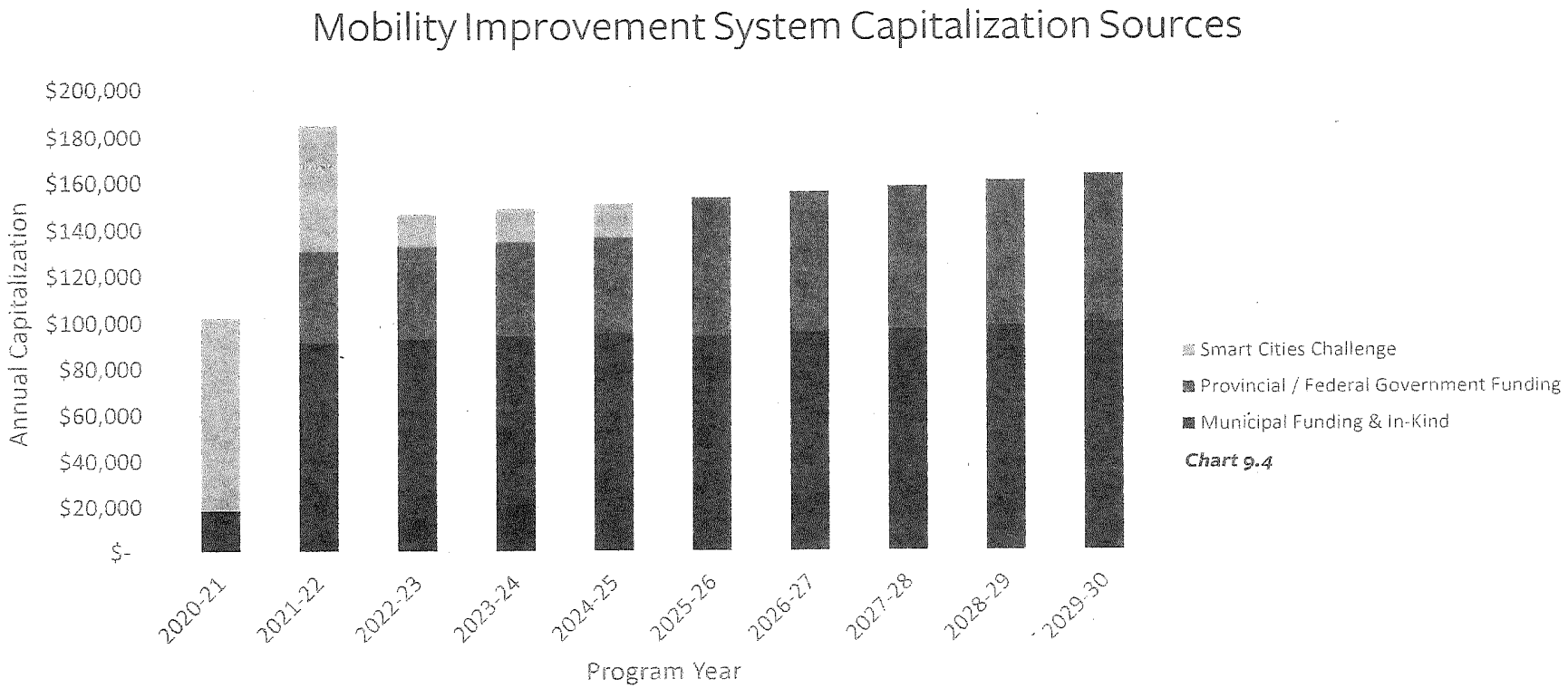
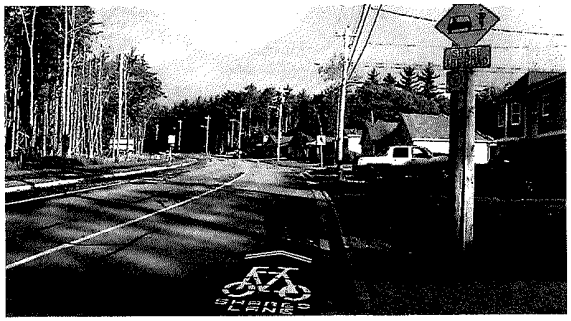


Chart 9.4



A shared bike lane on a residential street in Bridgewater.

After the Smart Cities Challenge timeframe, it is anticipated that the development of community energy systems would continue, with a similar patterns of capitalization: government de-risking activities followed by private-sector investment.

As seen in Chart 9.4, we propose that the Mobility Improvement System receive its development and operating funding from the Smart Cities Challenge grant in years 1-5. This amounts to $181,444. As the Town of Bridgewater's transit and active transportation systems fall under municipal purview, and investments in these systems typically do not yield financial returns, government funding is required to maintain service improvement efforts. Bridgewater has been successful in achieving transportation funding from the Province in recent years, and expects that 25-40% of transportation capital can come from these sources in the long run.

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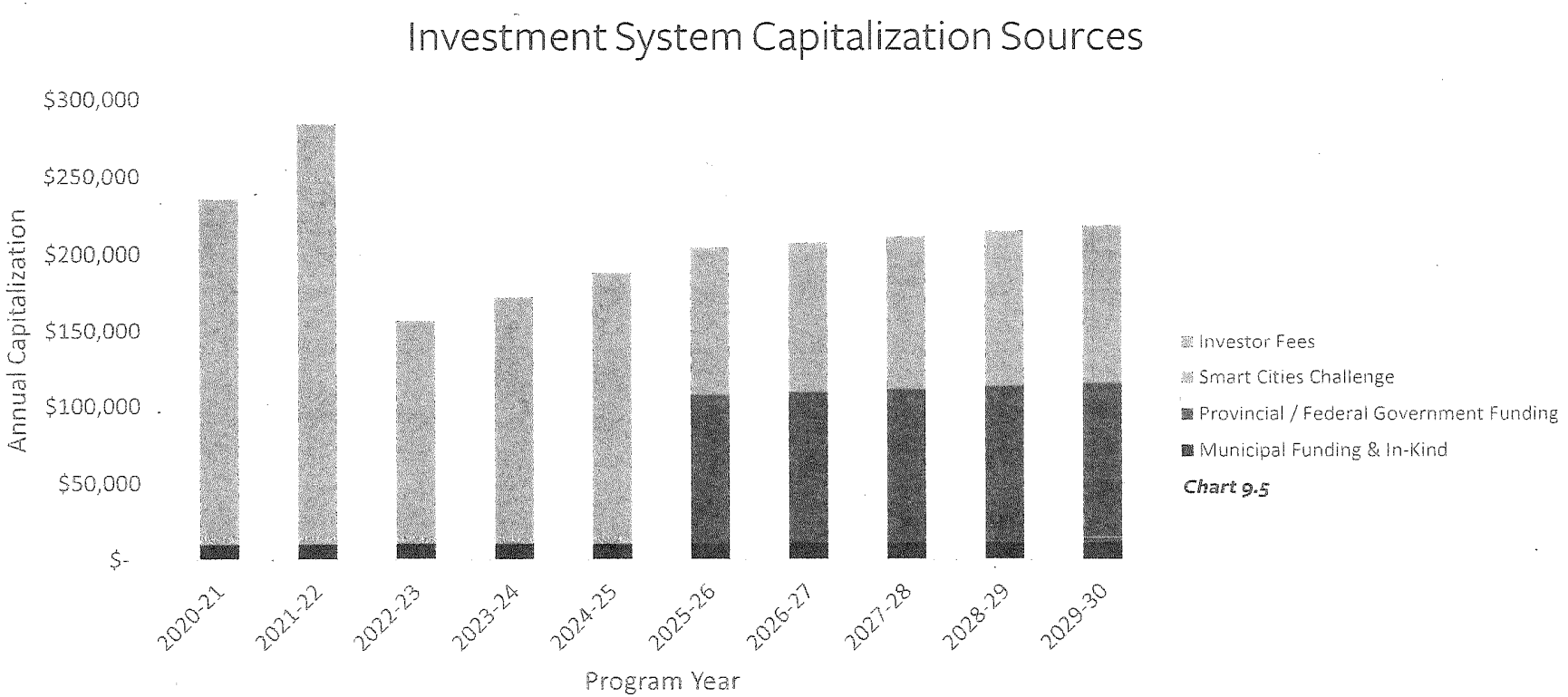


Chart 9.5



A contractor marks lines on a board of rigid insulation.

As seen in Chart 9.5, we propose that the Investment System receive its development and operating funding from the Smart Cities Challenge grant in years 1-5. This amounts to $985,716, representing 95% of costs, with municipal in-kind providing the remainder. This pattern would continue for the 5 years of the Smart Cities Challenge. After that timeframe, service funding is projected to come from a combination of senior government funding to provide core operating funding to the system, supplemented with user fees collected from investors and funders.

> I asked for weather-stripping and all my landlord did was take it from their door and put it on mine.
>
> – BRIDGEWATER RESIDENT

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Overall Program Management Capitalization Sources

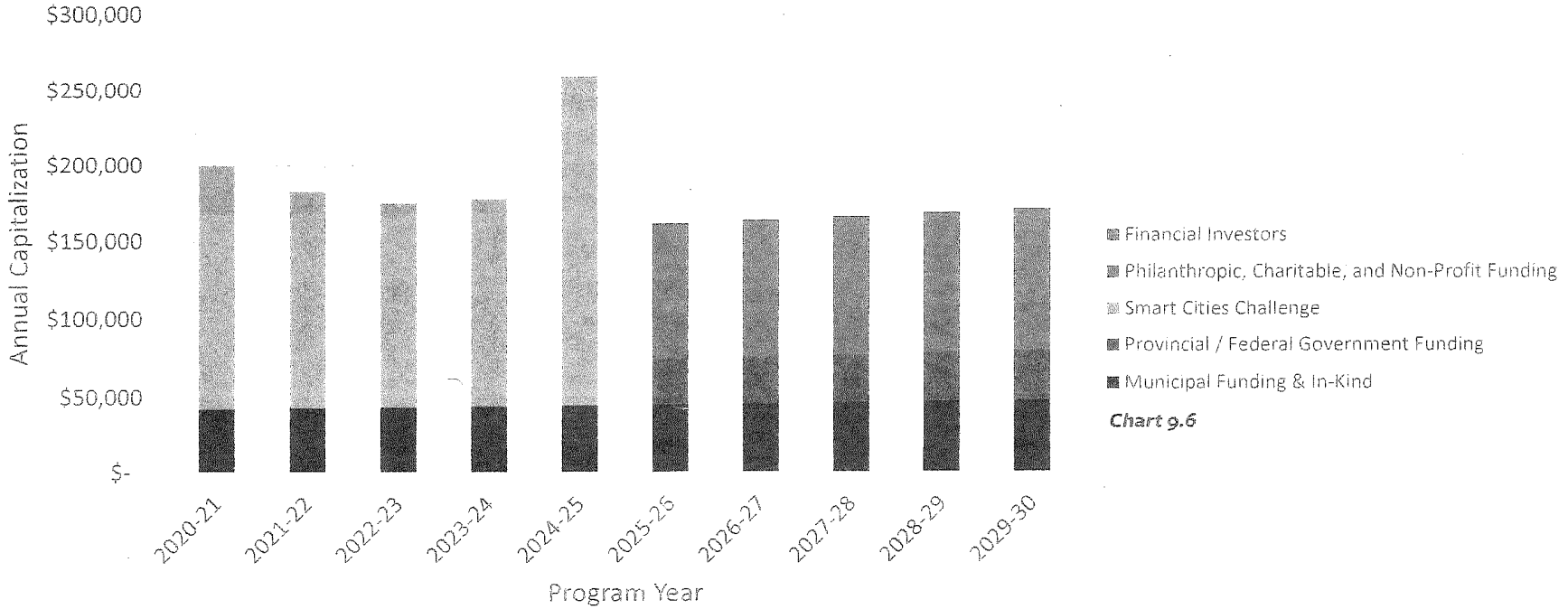
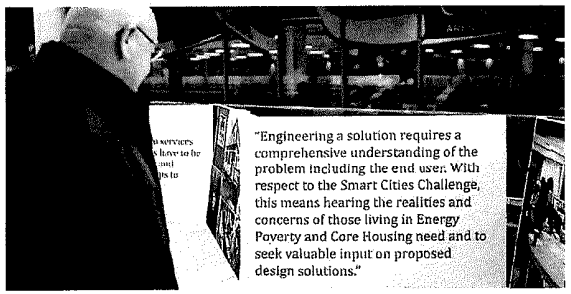


Chart 9.6

As seen in Chart 9.6, we propose that Overall Program Management receive its development and operating funding from the Smart Cities Challenge grant in years 1-5. This amounts to $776,666, representing 78% of costs, with municipal in-kind providing the remainder. This pattern would continue for the 5 years of the Smart Cities Challenge. After that timeframe, service funding is projected to come from a combination of municipal, senior government, and philanthropic funding, with and opportunity to explore subsidization by financial investors.

Last year power bill skyrocketed, you have to find ways, I paid rent and energy bill and put everything else on credit

– BRIDGEWATER RESIDENT



A Bridgewater resident reads a quote from an exhibit on energy poverty at a Smart Cities Challenge Open House.

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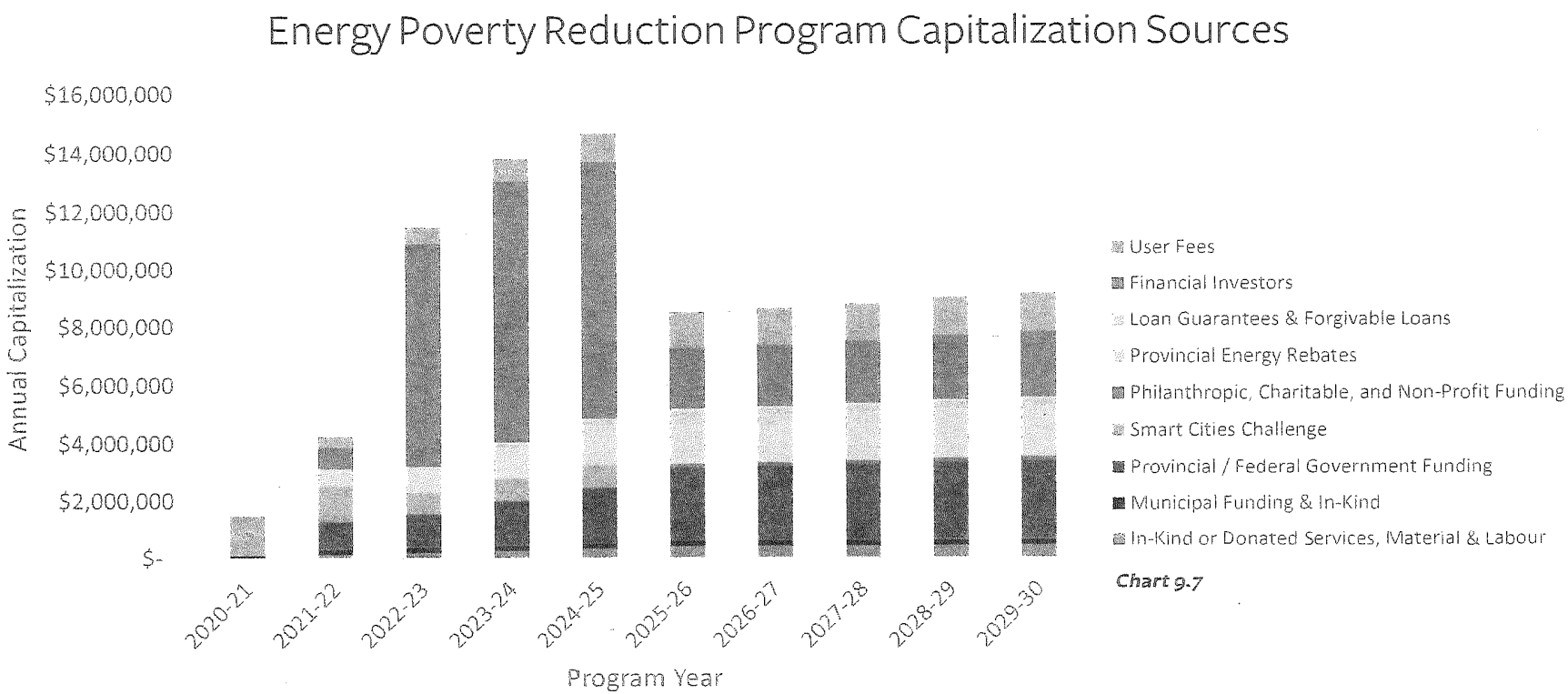


Chart 9.7

In summary, as seen in Chart 9.7, the Smart Cities Challenge grant would fund $5 million (11%) of the Energy Poverty Reduction Program in years 1-5. A diverse set of projects, with a large share of improvements that generate a positive return on investment, enables the stacking of funding and financing sources for years 2 onward. We proposed that this is a sustainable funding model for a town or a rural community, and that this same capitalization concept can be deployed throughout the Canadian context to achieve the program objectives presented in this application.

Capitalization Strategies

Community energy projects typically require upfront capital expenditures resulting in competing priorities, investment risks, layers of operating and ownership entities, all captured within a convoluted business model. Fortunately, as the world transitions to a clean energy economy and technology catches up with societal demand, financing mechanisms are evolving to support low carbon initiatives, and communities across the globe are beginning to share resources, learning experience, and innovative models.

The Town aims to further the aforementioned financial advancements by introducing a replicable model that uses existing tools and

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considers access barriers. The financing model is designed to maximizes existing resources and does so through an investment system composed of two fluid and close-knit sub-systems. The first being the municipal capitalization system, which is an internal Town application, ideally housed in TownSuite, with budgeting characteristics at its core. The municipal capitalization system is responsible for "specialized finance" stacking, assembling project opportunities and outcomes, sharing the opportunity with its counterpart system, and reporting to specialized financing proponents. The other system, the financial investment vehicle is external to the Town, through an existing or ground-up organization. The financial investment vehicle is responsible for traditional financing, inclusive of community investments, cash disbursements through outcome-data shared by the municipal capitalization system, investing in energy poverty reduction program assets, and reporting to investors.

An important component of the municipal capitalization system, and the Energy Poverty Reduction program as a whole, is utility grade service provision. A Bridgewater energy utility, or municipal-based utility grade services, will decentralize electricity disbursement, streamline the selling and buying of electricity to local stakeholders through self-service, and could mitigate the dependency on local energy markets if based on renewables. Being able to set optimized electricity tariffs would positively impact the rate of return. This program enhancing structure is enabled through legislation and aligns with the global movement of decentralizing a utility as a means to introduce renewables into the grid. This trend has a successful track record of deployment in the USA through the Community Choice Aggregation model and throughout regions of Europe.

The investment system is also supported by a community owned financing vehicle, which not only provides adequate pools of financing, but also provides socio-economic value to the community. A co-operative (co-op) structure provides its members with a democratic voice in the entity's decision-making processes. The co-op will own shares in a Community Economic Development Investment Fund (CEDIF) organization, and the coupling of these two symbiotic entities are responsible for financial investment vehicle operations. This model allows for at-risk participation, at-risk dividend-returns and is the vehicle that secures debt-financing and equity contributions from pools of local and national investors.

Early conversations with potential funding proponents suggest there is a wealth of interest in participating in the energy poverty reduction program due to the returns generated. Investor enthusiasm is further stimulated by the social returns, which align with their organization's mission. These conversations are reinforced by the current trend of impact investing growth which doubled in size between 2017 and 2018. Costs without a return on investment are not feasible expenditures for the Town to incur without 3rd party intervention. Thus, strategic partnering with social-value investors are essential to the program's success. Fortunately, there are a wealth of value-aligned resources at the Town's disposal whose relationships will be leveraged through shared goals and outcomes.

To explain the investment system engine, we'll first provide a high-level Investment System overview, then review its two major constituents: the Municipal Capitalization System and the Financial Investment Vehicle and all their intricacies. With these components defined at a high-level, we'll then examine Investment System activities, which provides an overview of the 4 major investment handling stages: planning, intake, delivery, output.

Due to the depth of funding resources, it is also important to define the hierarchy of senior and subordinated resources as a risk-mitigating exercise. Fundamental considerations are then summarized in the conclusion. With these systems defined, it is possible to design an

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Investment System schedule which highlights itemized activities and outputs throughout the 10-year Energy Poverty Reduction Program. These are broken down by investment sub-system: Municipal Capitalization System and Financial Investment Vehicle.

INVESTMENT SYSTEM OVERVIEW

The Investment System is composed of two sub-systems which act as the engines that fuels the energy poverty reduction project. The primary reason for this separation is directly linked to current legislation and the resulting inability to house all operations under one roof while still achieving the desired outcomes, as accentuated in the following section, Financial Investment Vehicle. There are 4 dynamic stages in the investment system's architecture which fit within the context of a Nova Scotian community, but is replicable nationally using tools and resources available within other provincial jurisdictions. At a high-level, both systems will interact with one-another and the Energy Poverty Reduction projects in a circular fashion.

In summary, both investment systems have a pool of investment resources. As Energy Poverty Reduction projects are defined, the energy poverty reduction portfolios are packaged into investible opportunities through the municipal capitalization system and shared with the *financial investment vehicle*. Both systems pool their resources to fund energy poverty reduction projects, and upon the development of revenue-generating systems, returns and/or reports are disbursed to each system and their pool of investors as outlined in agreements or offering prospectuses.

MUNICIPAL CAPITALIZATION SYSTEM

Municipalities must adhere to Municipal Government Act legislation. As such, the Town itself is limited to borrowing from the Municipal Finance Corporation capped by a debt service coverage ratio, and can only fund projects that it will own 100% of. Thus, off-book financing and diligent partnership agreements drive what is referred to as the "specialized and municipal funding streams". These streams are separated into 4 groups:

1. **Energy Solution Contracts**
   - **a.** Incentives: through organizations like Efficiency Nova Scotia
   - **b.** Savings Backed Agreements: through Energy Service Companies
2. **Social Value**
   - **a.** Senior government: provincial and federal
   - **b.** Charitable: donating organization
3. **Municipal**
   - **a.** Through the municipal-based utility from the Municipal Finance Corporation
4. **User Fees**
   - **a.** Amortizing mechanisms such as Property Assessed Clean Energy (PACE) programs
   - **b.** Upfront deposits

Municipal Capitalization System

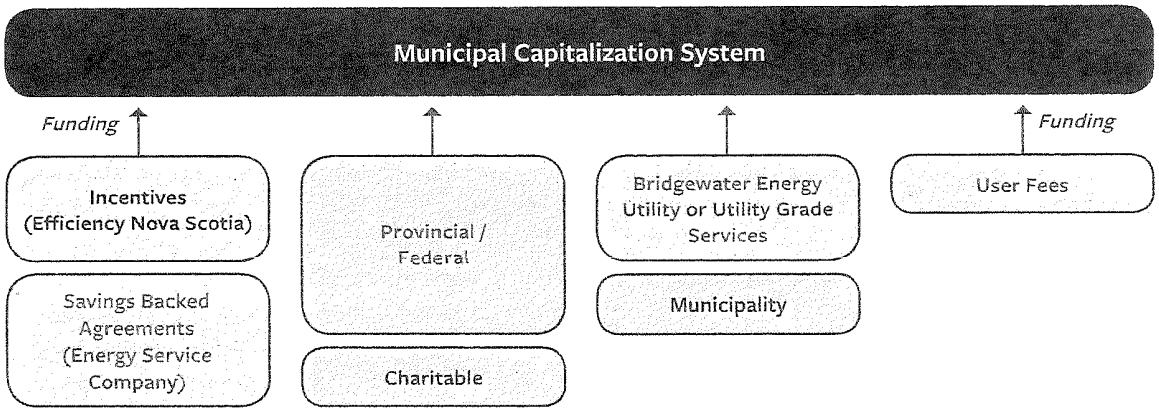


Diagram 9.1

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Energy Solution Contracts

Two key players will provide the Town with specialized funding through energy service contracts: Energy Service Companies and Efficiency Nova Scotia.

Energy Service Companies

Energy Service Company ventures have a proven track record of success. These companies have the capacity to execute on large scale ventures, and the risk is placed on the Energy Service Company rather than the property owner or municipality. Although contract negotiations are complex, Energy Service Companies may bid on the retrofit projects and the Town can secure a contract with the most attractive terms (amortization, interest rates, leverage). Energy Service Companies will be procured through a request for proposal process, and the winning proponent will finance and undertake retrofit developments and are paid back through guaranteed energy savings. As a result of economies of scale, the larger the Energy Service Company project scope the more attractive the terms.

Efficiency Nova Scotia

Efficiency Nova Scotia is a province-based, non-profit, energy efficiency utility which provides its customers with energy solutions through rebates on efficiency-based technologies. Through contractual agreements with Efficiency Nova Scotia, the Town can secure assets and services at a discount.

Social Value Investors

To cover the costs of line items with no return on investment, the Town must secure funding from sources who expect no financial return but are motivated by social outcomes instead Through the Income Tax Act, the Town is granted the authority to issue official receipts that can be used for charitable expenses for income tax purposes. This will appeal to donors contributing funds to the energy poverty reduction program. The Town envisions support from the federal and provincial government and arms-length government organizations such as the Canada Mortgage and Housing Association, whose 10-year, $40-billion national housing strategy plan aligns perfectly with the Town's Energy Poverty Reduction program.

Municipal

In Nova Scotia, municipalities are granted rights to become a wholesale electricity customer under the Electricity Act. This gives the Town of Bridgewater the ability to establish its own municipal-based energy utility, or procure utility grade services, through which it will provide electricity to customers in the town. This could offer significant benefits for Bridgewater, and

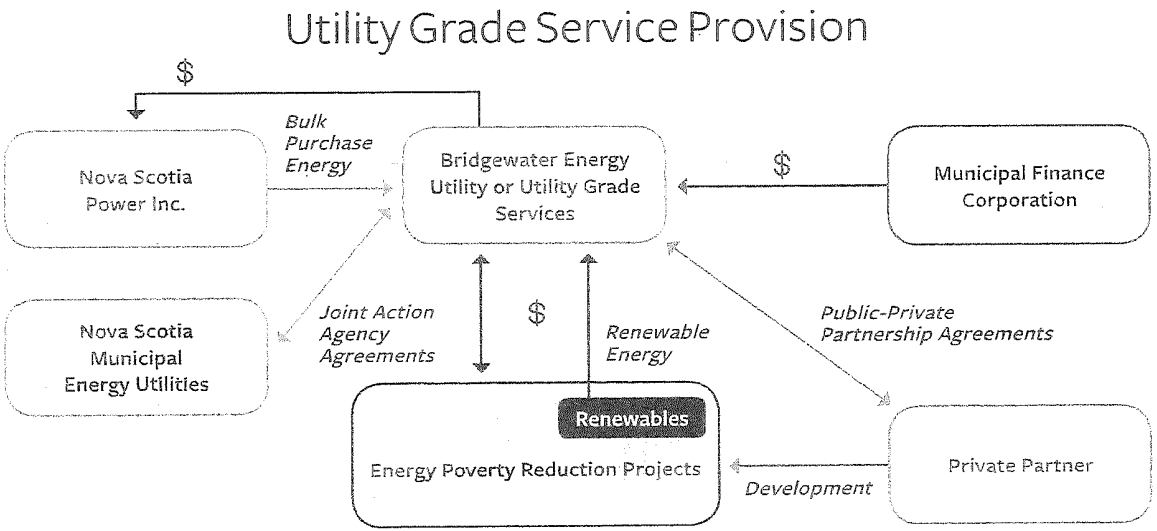


Diagram 9.2

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possibly the surrounding communities seeking to accelerate renewable energy and energy efficiency initiatives. An emerging trend of clustering utilities will also be explored further: the idea of combining utility services to optimize operations through interconnectivity while generating additional sources of revenue and/or decreasing existing utility costs. Diagram 9.2 below provides an overview of key municipal-based energy utility actions, and a summary of the infographic's components follows.

Nova Scotia Power Inc. | Renewables | Bulk Purchase Energy | Renewable Energy

The Town will procure its energy needs from the development of local renewable energy sources within the portfolio of energy poverty reduction projects and through bulk purchases of electricity from Nova Scotia Power Inc. Bulk purchasing will reduce costs to the Town's residents and energy imports will reduce over time through the development of local renewable energy sources.

Public-Private Partnership Agreements | Private Partners | Development | Nova Scotia Municipal Energy Utilities| Joint Action Agency Agreements

Partnering with a private entity through a Public-Private-Partnership agreement / Alternative Financing and Procurement may provide the Town with the capacity to build and operate a public utility or procure utility grade services. The Town can leverage its favorable relationships with other Nova Scotia municipal energy utilities to form a Joint Action Agency. Joint Action Agencies are a tool that municipal distribution utilities can use to accomplish their goals of reliable, safe and low-cost electric supply and services to their communities in an efficient and effective manner. Shared costs and mutual support make the effort manageable and provide an effective interface to the ever-growing complexity of the electric power supply industry.

Municipal Finance Corporation

In Nova Scotia, Municipal energy utilities are regulated by the Nova Scotia Utility and Review Board. Pursuant to the Public Utilities Act, the Utility and Review Board exercises general supervision over all electric utilities operating as public utilities within the Province. This authority includes setting rates, tolls, charges, and regulations for the provision of service and approval of capital expenditures in excess of $250,000. Debt incurred by a municipal utility through the Municipal Finance Corporation, must be guaranteed by the municipality and is reviewed by the province on a case-by-case basis. A business case, third party consultant reports to validate risks and assumptions, as well as required reserve funds are reviewed for borrowing consideration.

User Fees

Property Assessed Clean Energy (PACE) financing programs allows homeowners to finance energy efficiency, renewable energy and other eligible improvements on their buildings using private sources of capital. PACE programs are enabled through legislation and authorized at the local government level. Municipalities may directly administer residential PACE programs, or via public-private partnerships with one or more PACE administrators.

Two PACE programs are operating in Bridgewater: (1) Clean Energy Financing, financed through a municipal Local Improvement Charge via a Municipal Finance Corporation loan and secured through a property lien. (2) The Clean Net Zero pilot project is administered by Clean Foundation and financed in part through the Municipal Finance Corporation and in part through the LaHave River Credit Union. Both promise a 1:1 savings-to-debt ratio, to ensure that the homeowner remains cashflow neutral or positive.

It is envisioned that property owners enrolled in the energy poverty reduction program will incur some of the retrofitting costs. Whether this is through the aforementioned amortizing PACE structure, or simply an up-front contribution is still to be determined.

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Financial Investment Vehicle

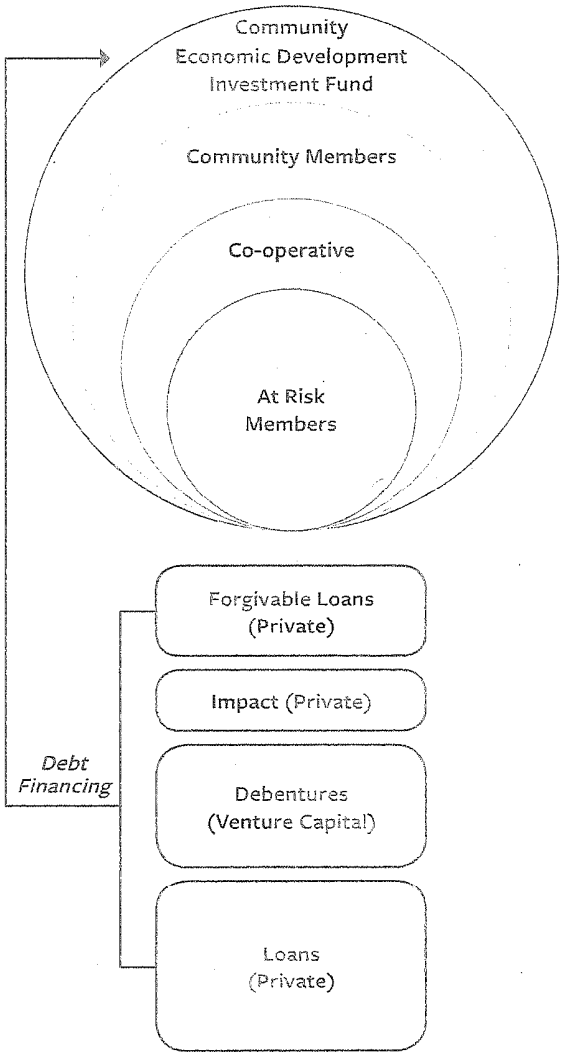


Diagram 9.3

Conclusion

The Municipality will act as the administrator of the 4 steams of funding and the collective activities and responsibilities create the foundation of the municipal capitalization system.

FINANCIAL INVESTMENT VEHICLE

An engine external to the municipality, not restricted to the Municipal Government Act, is required to exploit traditional and community forms of financing. To maximize the benefits of this structure, the Town will include a community-favouring organizational governance structure to allow for at-risk participation and community investments. The three major components to the traditional and community Financial Investment Vehicle are:

1. Community Economic Development Investment Fund (CEDIF)
2. Co-operative (Co-op)
3. Traditional Financing Sources

Community Economic Development Investment Fund (CEDIF)

CEDIFs are pools of capital which is raised from individuals through the sale of shares by for-profit entities to invest in projects. CEDIFs provide a mechanism for accessing local capital so that residents can directly invest in their communities. CEDIFs have had a history of success, a strong legal and regulatory framework paired with considerable support from the Province of Nova Scotia. This community-centric entity will allow for community members to participate in local infrastructure investments. This entity is the cornerstone mechanisms that will secure traditional forms of financing (debt), community financing (equity) and is structured to be the parent company of a co-operative.

Co-operative (Co-op)

A Co-op, such as an owner's co-op, will own a determined number of shares within the CEDIF entity. At-risk community members will be provided with co-op memberships and shares in the co-op. This set-up allows for this often-forgotten sub-section of the community to be given a voice through the democratic nature of a co-op. If carefully structured, the at-risk demographic will also receive dividend disbursements as a result of share-ownership through energy savings incurred through the energy poverty reduction program. That is, whatever is remaining after other financing proponents are paid their pre-determined dividends and interest/principal contractual obligations.

Traditional Financing Sources

The CEDIF will secure debt through traditional funding sources including, but not limited to, forgivable loans, impact investors, venture capital debentures, and traditional loans such as long-term-debt financing.

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Conclusion

The CEDIF will act similar to that of a special purpose vehicle, although it will not be considered a municipal arm's length entity. Securing traditional financing while allowing for community investments and at-risk participation create the foundation of financial investment vehicle.

INVESTMENT SYSTEM ACTIVITIES

Diagram 9.4 displays the dynamic activities of the Investment System, providing an overview of the 4 major investment handling stages: planning, intake, delivery, and output as summarized below.

Planning

- **ID projects:** The Town's Energy Management Information System identifies investible community energy system and houses energy management system portfolios.
- **Data Sharing - Energy Management Information System, Municipal Capitalization System:** The Energy Management Information System shares portfolio data with the Municipal Capitalization System, which refines this information to source capitalization streams.
- **Agreements Procured:** The Municipal Capitalization System determines the best-value coupling of specialized and municipal funding streams and approaches these proponents to secure agreements, both long and short term.
- **Data Sharing - Municipal Capitalization System, Financial Investment Vehicle:** The Municipal Capitalization System shares project financing requirements with the Financial Investment Vehicle.
- **Institutional Prospectus:** The Financial Investment Vehicle generates institutional prospectuses and signs contracts with traditional investors whom provide the best value for the Town.
- **Community Prospectus:** The Financial Investment Vehicle generates a CEDIF prospectus with terms that aligns with the Town's needs yet is attractive to community investors.
- **As Risk Shares:** Co-op and membership shares are issued to at-risk community members participating in the Energy Poverty Reduction program.

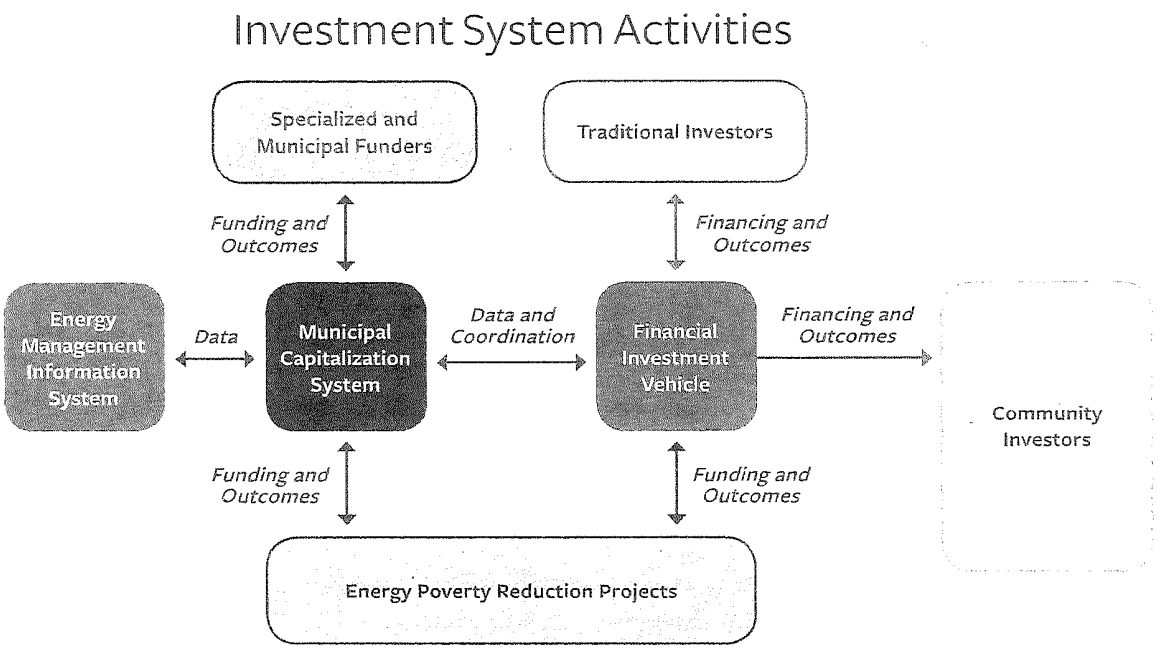


Diagram 9.4

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$ FINANCIAL

Intake

- **Funding and Contributions:** The Municipal Capitalization System receives funding and resource contributions from specialized and municipal funders.
- **Institutional Investments:** Institutional investments flow to the Financial Investment Vehicle from a variety of traditional investor sources with specified terms attached.
- **Community Investments:** CEDIF investments flow from the community investors to the Financial Investment Vehicle.
- **Data Sharing - Financial Investment Vehicle, Municipal Capitalization System:** The Financial Investment Vehicle and the municipal capitalization system share funding contributions with one another.
- **Data Sharing - Municipal Capitalization System, Energy Management Information System:** The Municipal Capitalization System shares cumulated funding information with the Energy Management Information System to match funding to initial requirements.

Delivery

- **Data Sharing - Energy Management Information System, Municipal Capitalization System:** The Energy Management Information System and the Municipal Capitalization System confirm capitalization costs match procured funding.
- **Data Sharing - Municipal Capitalization System, Financial Investment Vehicle:** The Municipal Capitalization System confirms funding distribution requirements with the financial investment vehicle.
- **Funding:** Both the Municipal Capitalization System and the Financial Investment Vehicle contribute their pre-determined funding amounts to the Energy Poverty Reduction systems, whereby there is no return on investment on management systems, a marginal return on investment on mobility systems, and a significant return on investment on community energy and housing energy management systems.
- **Data Sharing Energy Poverty Reduction Systems, Energy Management Information System:** Energy Poverty Reduction program outcomes flow to the Energy Management Investment System, which tracks performance results.

Outputs

- **Data Sharing - Energy Management Investment System, Municipal Capitalization System:** Energy Management Investment System performance and outcome data is shared from the Energy Management Information System to the Municipal Capitalization System.
- **Reporting, Energy Savings and Profit:** The Municipal Capitalization System reports outcomes to funders on a pre-determined schedule as outlined in contractual agreements. Energy saving are reconciled with applicable proponents such as Energy Service Companies.
- **Data Sharing - Municipal Capitalization System, Financial Investment Vehicle:** The Energy Poverty Reduction system performance and outcome data is shared from the Municipal Capitalization System to the Financial Investment Vehicle.
- **Reporting and Institutional Disbursements:** The financial investment vehicle disburses interest and principal payments accompanied by any outcome reporting requirements defined in the executed contracts.
- **Reporting and Community Dividends:** The Financial Investment Vehicle issues dividends and tax statements to CEDIF investors. Any additional revenue is passed through the CEDIF to the at-risk co-op members and shareholders.

HIERARCHY OF SENIOR AND SUBORDINATED RESOURCES

In the event that any component of the Energy Poverty Reduction Program defaults, it is important to determine the seniority of capital. Although it is too early in the investment design phase to define orders of subordinated debt, some generalizations can be made. For example,

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charitable and senior government bodies would have no expectations if the projects are to default, while debentures such as venture capital would expect default disbursements prior to forgivable private loans. These details will be outlined in all funding agreements and are to be presented in an identical manner from one parties' prospectus to another.

INVESTMENT SYSTEM CONCLUSION

The Investment System relies heavily on accurate data flows, meticulous contract negotiations, and timely cash disbursements. If diligently integrated with connected technologies, there would be fluidity with dataflows that would enable this cyclical engine to allow for sustainable project development. Although certain components, such as CEDIFs, are region specific, it is possible to substitute this tool with one found in similar jurisdictions. For example, community bonds could provide the community financing component of this model in Ontario. Finally, in detailing the system's characteristics, one must consider the best accounting practices for each component and ensure all nodes are able to share data compatibly, and without delay, from one party to another.

USE OF FINALIST GRANT

Our community greatly appreciates having been awarded $250,000 through the Smart Cities Challenge Finalist Grant. The grant has allowed us to achieve program design innovations that would otherwise simply not have been possible. The proposed use of the finalist grant, from our original application, is described in Table 9.14.

The Town intended to leverage $250,000 of grant funding with $54,000 in in-kind support (through staffing) to achieve a total project value of $304,000. Following the completion of the Final Application, the revised use of finalist grant can be viewed in Table 9.15.

Variances between the budgeted use of the Smart Cities Challenge Finalist Grant and projected actual costs are explained as follows:

- **Priority 1:** underspent by $17,054 as capacity building costs were shifted from contract work to in-kind work (staffing). Reflected in increased in-kind contribution for this priority area.
- **Priority 2:** overspent by $20,031 due to a greater level of community engagement activity than originally envisioned, including the production of youth-at-risk documentary on the subject of energy poverty, and a robust communications strategy.
- **Priority 3:** overspent by $26,522 due to a greater need for technology, data flow, and privacy impact assessment than originally anticipated. In-kind costs (staffing) were captured under priority 1.
- **Priority 4:** underspent by $30,410 due to a lower need for professional resources (legal counsel, consultants) for project partner engagement. Budget set aside for partnership contract development was unused. In-kind costs (staffing) were captured under priority 1.
- **Priority 5:** overspent by $911 due to higher than anticipated professional costs in developing the Final Application. In-kind costs (staffing) were captured under priority 1.

Proposed Use of Finalist Grant for Initial Application

Priority Area Capitalization Source	Smart Cities Finalist Grant	Town of Bridgewater In-Kind	Total Value
Priority 1: increase capacity & knowledge	$50,000	$20,000	$70,000
Priority 2: engage community	$45,000	$7,000	$52,000
Priority 3: refine approach to technology & data	$65,000	$5,000	$70,000
Priority 4: refine service delivery approach	$85,000	$20,000	$105,000
Priority 5: create final proposal	$5,000	$2,000	$7,000
Total	$250,000	$54,000	$304,000

Table 9.14

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Actual Use of Finalist Grant

Priority Area	Smart Cities Challenge Finalist Grant				In-Kind Contributions			Total Value
	Consultants	Resources	Staffing	Sub-Total	Town of Bridgewater	External Partners	Sub-Total	
Priority 1: increase capacity & knowledge		$6,050	$26,896	**$32,946**	$45,156		$45,156	**$78,102**
Program staffing			$26,896	$26,896	$45,156		$45,156	$72,052
Energy poverty research contracts for local organizations		$6,050		$6,050				$6,050
Priority 2: engage community	$48,621	$16,410		**$65,031**		$7,000	$7,000	**$72,031**
Honoraria participants in interviews and focus groups		$2,500		$2,500				$2,500
Community-wide paper survey		$5,748		$5,748				$5,748
Communications Plan development and implementation	$23,621	$1,872		$25,492				$25,492
Youth video documentary	$17,000			$17,000		$7,000	$7,000	$24,000
Hosting public events		$6,290		$6,290				$6,290
Facilitation support for interviews, focus groups and events	$8,000			$8,000				$8,000
Priority 3: refine approach to technology & data	$91,522			**$91,522**				**$91,522**
Project consultant - data & connected technologies	$44,217			$44,217				$44,217
Project consultant - preliminary Privacy Impact Assessment	$23,543			$23,543				$23,543
Project consultants - energy, cost, and emissions modelling support	$23,762			$23,762				$23,762
Priority 4: refine service delivery approach	$30,940		$23,650	**$54,590**				**$54,590**
Project consultant - evaluation	$1,740			$1,740				$1,740
Project consultant - project development and capitalization	$29,200		$23,650	$52,850				$52,850
Priority 5: create final proposal	$5,911			**$5,911**				**$5,911**
Final application editing	$2,000			$2,000				$2,000
Final application layout	$3,911			$3,911				$3,911
Total	**$176,993**	**$22,460**	**$50,546**	**$250,000**	**$45,156**	**$7,000**	**$52,156**	**$302,156**

Table 9.15 Note: all dollar figures include municipal net of HST. Note also that due to the ongoing costs associated with completing the final application, and the time required to receive and process invoices, project costs reported in this table are projections up to March 31, 2019. Actual expenses will be available after that date.

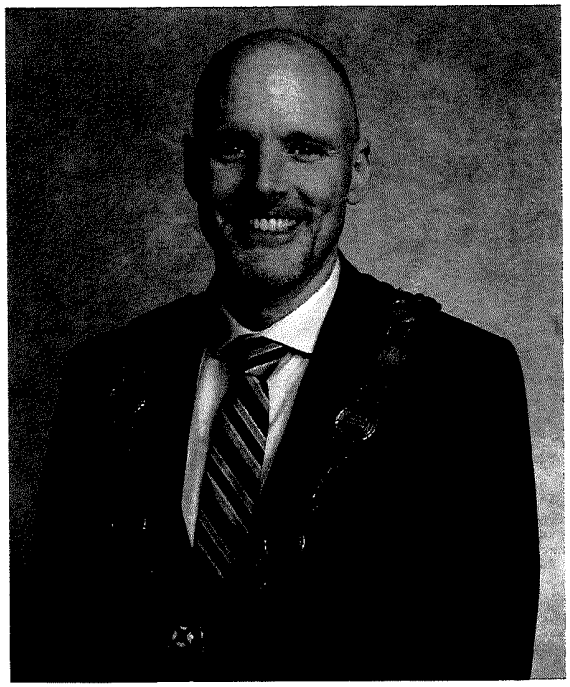
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ENERGY POVERTY REDUCTION PROGRAM

Final Application to the Smart Cities Challenge $5M Prize Category

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MESSAGE FROM THE MAYOR



Mayor David Mitchell

Our community will lift its residents out of energy poverty, starting by reducing the energy poverty rate by 20% by 2025.

As Mayor of the Town of Bridgewater, that is a challenge statement that makes me proud to serve my community. The fact is, Bridgewater is ready for a massive shift toward a smart energy economy by becoming a Smart Community. Through our Energize Bridgewater program, our community has demonstrated nationally-recognized leadership in understanding and planning a pathway toward a new kind of energy economy – one where energy services are universally available and affordable, clean and efficient, and protected from supply volatility and the coming ravages of climate change.

Through our proposed solutions, we will make sure that those among us who are most vulnerable, and least able to afford the transition, are the first ones we help across the threshold. Those residents have the most to lose, and through the betterment of their lives, our community has everything to gain.

The stories shared by our community partners and residents have made it clear that energy poverty is having a profound and debilitating impact here in Bridgewater. It systematically strips as many as 40% of our residents of their dignity and damages the physical and mental wellbeing of young and old alike.

Yet, the real, lasting, and practical solutions to this problem are so close at hand that we can already see them emerging. Through this Challenge, our town will design and prototype a new model of municipally-led accessible and affordable energy management services for our community's most vulnerable residents. Dramatic improvements to housing, transportation, and community services will be driven by a self-financing investment program and a coordinated access system, all powered by connected technologies.

We've been innovative. We've been bold. We've made change happen. However, nothing we've done to date has come close to achieving the impact of our proposed Energy Poverty Reduction Program. At the same time, everything we've done to date has prepared us to make this leap.

We need help in launching this bold idea. By selecting Bridgewater as the winner in the $5 million Smart Cities Challenge prize category, Canada will support a powerful new demonstration of technology-enabled community-based problem solving that addresses both the poverty crisis and the climate crisis at the same time. Bridgewater is ready to show Atlantic Canada, and the nation, how it can be done.

David Mitchell
Mayor, Town of Bridgewater

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EXECUTIVE SUMMARY

Our community will lift its residents out of energy poverty, starting by reducing the energy poverty rate by 20% by 2025.

Bridgewater's growing need for clean and reliable energy is limited by our ability to afford it. Our estimates show that the burden of energy poverty is carried by 38% of Bridgewater households that are unable to meet their basic energy and transportation needs. Many more are at risk of falling into this category as it's expected that energy prices will continue to trend upwards. Bridgewater is approaching this issue through systematic change at a household, neighbourhood, community, and regional level by, treating access to affordable and secure energy as a requirement for healthy living. To ensure residents can live free of the constant threat of energy poverty, our program uses energy management as a smart city approach for resident empowerment.

Bridgewater envisions an Energy Poverty Reduction Program that uses data and connected technology to bring together and drive energy savings to create financial returns for households and property owners. This system also provides coordinated access to community supports for households experiencing energy poverty. And finally, a financial system that supports extensive investment in energy efficiency solutions. Bridgewater's impactful, comprehensive approach to community-based problem solving and transformational change is highly transferrable to communities across the country that are struggling with energy poverty challenges of their own. Municipalities are uniquely positioned to be at the forefront the of shifting world of energy systems, pairing data and connected technologies for community services that ensure underserved populations are the first beneficiaries of the energy transition.

1. **Vision:** why this matters, and overview of services
2. **Performance Measurement:** detailed program descriptions, deliverables, and outcomes
3. **Governance:** accountability structure, and program partners
4. **Project Management:** team members and risk management
5. **Technology:** data platforms, connected technologies, and energy solutions
6. **Data and Privacy:** how information will be used, safeguarded, and shared
7. **Engagement:** community consultations up to now, and going forward
8. **Implementation Phase Requirements:** fulfilling national expectations
9. **Financial:** costs, revenues, innovative financing solutions, and how we used the Finalist Grant

Appendix: letters of support

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TOWARD A FUTURE FREE OF ENERGY POVERTY

Bridgewater, like most communities across Canada, has a growing hunger for energy. Our energy needs are everywhere – cellular phones, warm showers, food refrigeration, heat during the frigid winters, lights, laundry, and computers. With our energy needs increasing, many households in Bridgewater are unable to afford the rising costs of this service and are having to make impossible decisions to balance monthly household budgets.

As a 'have not' province, Nova Scotia has struggled for decades with the issue of widespread poverty and low incomes. Given our region's and our community's overall economic challenges, energy insecurity adds a real and growing threat to our ability to meet our basic needs. When we asked our community partners to tell us how urgent energy poverty issues are in relation to other issues in Bridgewater, Family Service of Western Nova Scotia stated: "this may be the least talked about yet most significant and productive structural, community, and individual issue we could tackle." The challenge of energy poverty is daunting and overwhelming, yet the Town of Bridgewater is firmly convinced that it is possible to create a solution to both the poverty crisis and the climate crisis by using technology-enabled community-based problem solving.

Energy poverty isn't just lingo for Bridgewater – it is a real problem for real people. Our program team has spent considerable effort in defining this term to be meaningful to our residents, especially those who identify with its hardships. In our initial application, we **defined energy poverty using the indicator of a household spending 10% or more of its after-tax income on energy, with fuels and electricity for the home as well as transportation counting toward energy expenditures.** We maintain that this definition is accurate, but understand that energy poverty can also be so much more.

Bridgewater and its community further defines **energy poverty based on access to affordable and secure energy in their home, neighbourhood, community, and region. The greater the degree of insecurity or lack of access, the greater the risk that the household will experience energy poverty**[1] This shift in perspective lifts the burden of energy poverty mitigation from being focused solely on the individual household, toward including community and regional infrastructure and services.

With this new emphasis on risk for energy poverty, research was required to determine what exactly the risk factors are and how this affects Bridgewater's vulnerability. Table 1.1 describes the energy poverty risk factors identified by our community.

Systematic Levels of Energy Poverty Risk

Risk Level	Description
1. Household	Household-level risk factors include personal risk influences such as the energy efficiency of the home and transportation means as well as general poverty risk factors such as income, health, literacy, family supports, etc.
2. Neighbourhood	Neighbourhood-level risk factors include neighbourhood energy systems, walkable streets, transit service, etc., as well as the energy efficiency of multi-unit residential buildings (MURBs).
3. Community	Community-level risk factors include community-scale energy and transportation systems, the energy efficiency of the overall housing stock, community support services, social stigma, and whether the community has developed a coordinated response to the problem of energy poverty.
4. Broader Systems	Broader systems-level risk factors include the price of energy in the region; the availability of secure, affordable energy technologies; employment opportunities; economic diversity, etc. It also includes provincial and federal programs and policies that may remedy or exacerbate energy poverty.

Table 1.1

[1] This model of energy poverty aligns well with the Social Determinants of Health and other health risk and inequality models used by modern public health initiatives including Health Canada.

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VISION

As Bridgewater gained a greater understanding of energy poverty during the final application phase, the breadth of its impact on our community became startlingly clear. Early research indicated that as much as 40% of Bridgewater's population may be experiencing energy poverty in some form. A community census was undertaken to validate residents' lived experience with energy poverty. From that census, we can confirm that 38% of residents currently experience, or are highly at risk of, energy poverty. Add to that the recent Statistics Canada report that the number of Nova Scotian children in poverty has risen from 14% in 2016 to 17% in 2017[2] and it is very clear that the problem of poverty in our community is not going away and requires urgent and responsive action.

Bridgewater is a community driven to overcome our challenges through deep engagement and innovative projects. To demonstrate our sincerity in creating real and meaningful change, Bridgewater commits itself to the following Challenge Statement:

Our community will lift its residents out of energy poverty, starting by reducing the energy poverty rate by 20% by 2025.

Targeted Energy Poverty Reduction Rate by Program Year

Year	2020-21	2021-22	2022-23	2023-24	2024-25	2029-30 After 5 more years
Population *(projected)*	9,031	9,156	9,211	9,266	9,320	9,583
Households Experiencing Energy Poverty *(projected, based on current 38.5% energy poverty rate)*	1,659	1,682	1,692	1,702	1,712	1,760
Number of Households Helped *(Cumulative)*	0	50	125	225	350	1,100
Energy Poverty Rate Reduction *(Cumulative)*	0%	3%	7%	13%	20%	62%

Table 1.2

With a five-year implementation horizon for the Smart Cities Challenge, the community has designed a program that will reduce the energy poverty rate in Bridgewater by 20% by 2025, while maintaining the long-term goal from the original challenge statement to lift 20% of its residents out of energy poverty within 10 years. With a $5 million grant from Smart Cities Challenge, the Town is confident that change can be realized within a single generation. And with a revised start date of 2020, the Town is eager to begin this very important work.

Based on the current and projected future population of the community, our Challenge would mean lifting 350 households out of energy poverty by fiscal year 2024-25. The community would then be on track to cut its overall energy poverty rate in half by 2028, and by as much as 62% over a 10-year timeframe (by fiscal year 2029-30). Our anticipated progress is illustrated in Table 1.2.

The Town of Bridgewater envisions a future for our community where energy poverty reduction strategies work in tandem with clean and efficient energy systems to confront energy poverty at its core – the very source of the energy itself. With assistance from the Smart Cities Challenge, we will overcome existing barriers to achieve our community vision:

[2] Statistics Canada, accessed on February 28, 2019 https://www150.statcan.gc.ca/t1/tbl1/en/cv.action?pid=1110013501

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By 2050, Bridgewater's green, self-supportive economy will be securely powered by clean and efficient energy systems. The community's conscious investments into energy infrastructure, equipment, training, and education will make energy affordable and accessible for all members of the community, and contribute to our town's prosperity and resilience in the face of a changing climate and world.

- Bridgewater's Energy Shift vision, Community Energy Investment Plan (2018)

Our commitment to this project will empower our community to take a leadership role in combating energy poverty, which is a daily threat to our sustained health and economic viability. The energy poverty solution is our most ambitious vision to date and we can't wait to show the rest of Canada that even small towns like Bridgewater can lead a change of this magnitude.

ENERGY MANAGEMENT AS A SMART CITY APPROACH

Households experiencing energy poverty know first-hand the critical importance of managing their energy consumption and therefore their expenses. The stories we have collected from the community have been truly stunning in this regard: we have documented families turning off their heat for days at a time in the middle of winter to be able to afford their next power bill, or going without light and powered devices at the expense of their health and wellbeing. From an energy management perspective, this has informed us that Bridgewater residents who experience energy poverty often already have well-practiced skills in energy management. What they tend to lack is energy efficient home heating systems and other infrastructure to work with, and adequate control over their home and transportation options.

I reduced my power bill from $120 to $60 by unplugging everything when I am not using it. I don't really use lights, only when company is over. I use my phone as a flashlight. – RESIDENT, TOWN OF BRIDGEWATER

Bridgewater's Energy Poverty Reduction Program is well matched to a smart cities approach, as it aims to restore control to our residents over their energy costs and infrastructure by leveraging the fundamental benefits that data and connected technology have to offer. Throughout this application we will reinforce how a small town can be a smart city by showcasing:

- how data can be used to create open and strong communities inclusive of the most vulnerable members and how access barriers to this data can be overcome (**See Data and Privacy chapter**);
- how data and connected technology can be a uniting force to bring together the municipality, other levels of government, government organizations, and private enterprise (See **Technology chapter**);
- how the innovation of one community can be transferable to our neighbours across the nation (see **Performance Measurement** and **Project Management chapters**);
- how connected technology enables collaboration between service providers and industry for the betterment of society (See **Governance chapter** and **Data and Privacy chapter**).

Through the program, the Town of Bridgewater will provide advanced new **energy management support services** to 2 primary clients:

1. Bridgewater households who are highly at risk of energy poverty, currently estimated at 38% of Bridgewater's population.
2. Bridgewater property owners whose properties are inhabited by households-at-risk of energy poverty. Housing energy efficiency is a key risk factor in determining whether or not a household will experience energy poverty. Groups of property owners can be clustered together to receive neighbourhood-scale energy services and solutions.

In situations where the households-at-risk own the homes they live in, the two clients are one and the

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same. For a large number of households-at-risk, however, home ownership is not affordable, and rental housing is their only option. In this case, the property owner is the household's landlord. In Bridgewater, 43% of residents rent their home (Statistics Canada, 2016). We anticipate that the majority of property owners in the programwill be landlords.

As we explain in the rest of this application, the Energy Poverty Reduction Program builds on existing municipal service competencies, data systems, and infrastructure. As such, this service concept is widely replicable and transferrable to other communities where municipalities already play a critical role in community service provision.

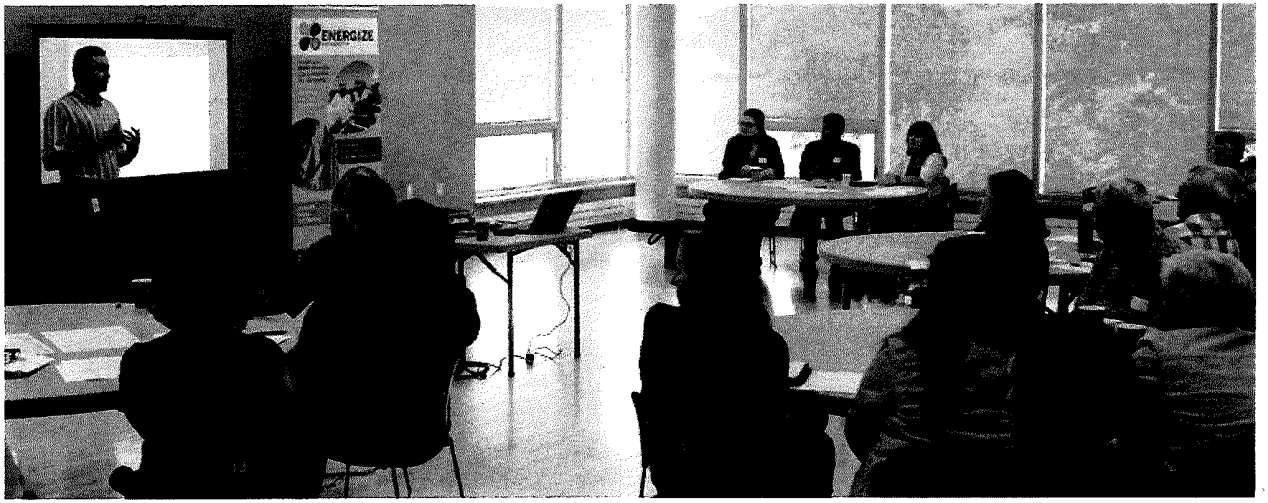
For those experiencing energy poverty, access to the technology and data to manage their energy needs is often very limited. For the most vulnerable, interfacing with a human rather than a dashboard is the most practical way to assist with assessing their needs and solving the immediate problems caused by energy poverty. Not having or being at risk of losing their shelter, these residents will need access to a range of community, health, employment, and other services, not just services that relate to housing and transportation.

The program will establish navigators for the different system components of the Energy Poverty Reduction Program. These navigators will be human interfaces for households-at-risk, connecting them with the services they need, including the energy management services offered by the Town of Bridgewater. Coordinated Access Systems are widely replicable and transferrable to other communities. Additional information is provided in the following chapters.

INNOVATION AT THE CORE

The design of the Energy Poverty Reduction Program combines 3 innovative mechanisms to reduce risk of energy poverty:

1. Connected technologies: forming the backbone of the service concept, connected technologies provide a technological 'engine' that drives energy savings to create financial returns for the households and property owners, and streamlines client intake and access to community services.
2. Coordinated access: a social support 'engine' that keeps clients connected to the program and coordinates access to the various additional community supports households-at-risk may need.
3. Financial investment: building on Bridgewater's experience developing a fully-costed approach to energy transition, self-financing energy improvements provide a financial 'engine' that supports extensive investment in energy efficiency solutions.



Community Working Group members view a presentation at a Smart Cities Challenge workshop.

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Core Design Innovations

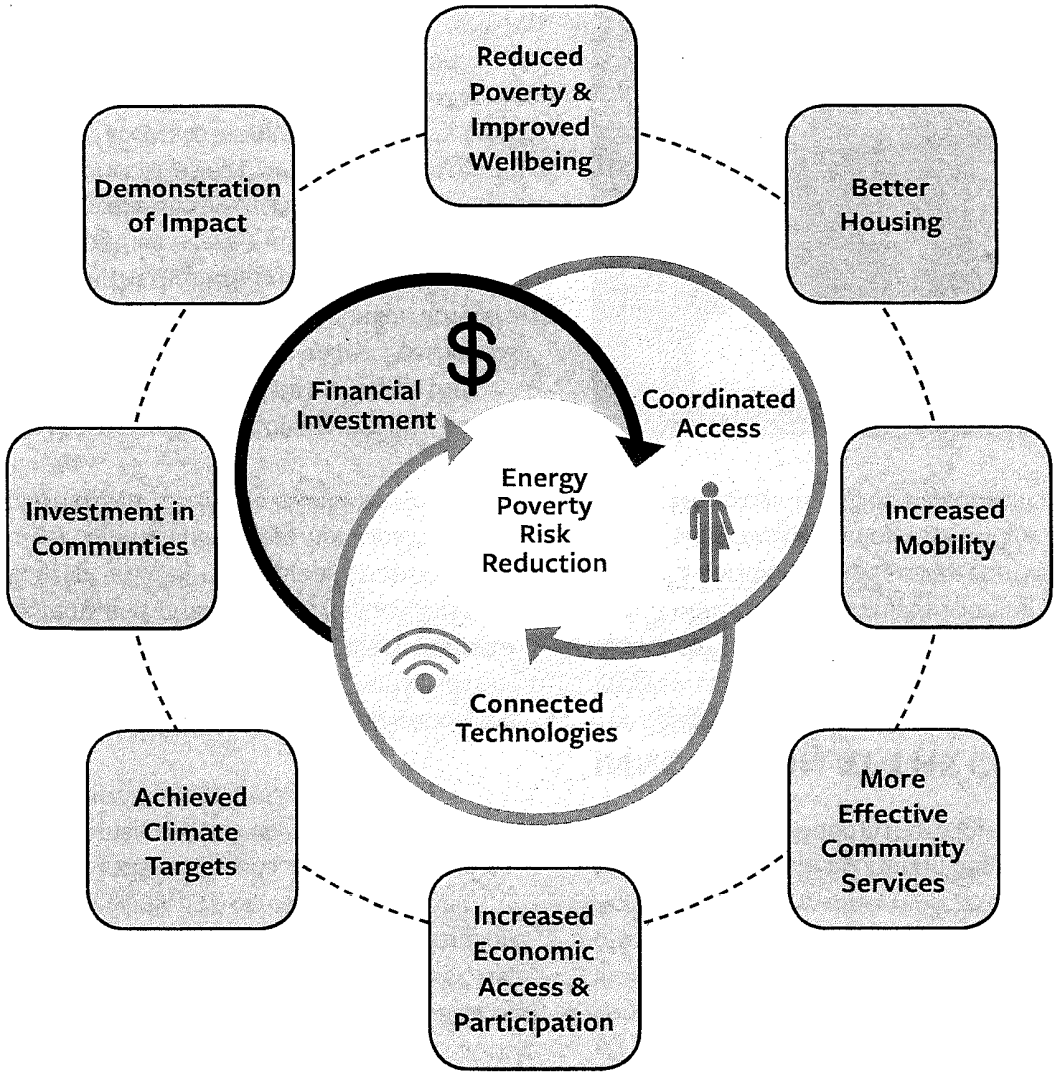


Diagram 1.1

These 3 innovations mutually enable and strengthen each other's outcomes. This synergy drives systematic and continuous improvements to housing, transportation, and community services, thereby reducing energy poverty risk and improving many dimensions of community life. These innovations and their anticipated outcomes are captured visually in Diagram 1.1.

A GREATER COMMUNITY IMPACT

Starting with our initial application, we have embarked on a deep and meaningful discussion with our community. From households-at-risk, to community service organizations, to landlords and energy utilities, the Town has listened to lived experiences in our community and developed a program that will positively impact a multitude of community needs. Consequently, our program outcomes have grown substantially. Table 1.3 summarizes the anticipated outcomes by category, and indicates their relationship to our initial application:

The expanded outcomes demonstrate a greater understanding and articulation of our Challenge to lift our residents out of energy poverty. Cumulatively, they reflect the community's urgent call for transformative change at all levels to achieve this goal. The outcomes are transferrable to other communities with very different local and regional contexts compared

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Anticipated Outcomes by Category

Outcome Category	Outcomes	Relation to Initial Application (April 2018)
Reduced Poverty & Improved Wellbeing	1. Reduce energy poverty rate	Challenge statement
	2. Reduce poverty	New
	3. Improve health of residents	Outcome 6
	4. Increase residents' quality of life	New
	5. Increase residents' sense of empowerment and inclusion	New
Better Housing	6. Increase energy security for residents	New
	7. Reduce and stabilize energy expenses for residents	Outcome 4
	8. Improve relationship between tenants and landlords	New
	9. Improve residential energy management practices	New
Increased Mobility	10. Improve residents' mobility	Outcome 3
More Effective Community Services	11. Improve residents' access to community services	New
	12. Improve community service delivery efficiency and effectiveness	Outcome 7
	13. Shift community service spending toward systemic solutions	Outcome 8
Increased Economic Access & Participation	14. Increase residents' income	Outcome 8
	15. Increase residents' participation in the green economy	Outcome 8
Achieved Climate Targets	16. Reduce greenhouse gas emissions	New
	17. Shift to efficient, clean, affordable, and secure energy	New
Investment in Communities	18. De-risk affordable energy investments in the community	New
	19. Successfully fund energy poverty reduction solution	New
Demonstration of Impact	20. Demonstrate feasibility and effectiveness of program	New
	21. Inspire structural energy poverty solutions at the Provincial and Federal levels	New
	22. Inspire other communities to adopt energy poverty reduction efforts	New

NOTE: No outcomes have been lost between the initial and final applications. Outcome indicators and targets are described in detail in the **Performance Measurement chapter.**

Table 1.3

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to Bridgewater. While other communities may need to make modifications to the specific indicators used to measure progress based on locally available information, the outcomes are universally meaningful, measurable, monitorable and well-suited to a smart cities approach.

APPLICATION REFINEMENTS TO BETTER ACHIEVE OUTCOMES

In order to lift our residents out of energy poverty, the design of the Energy Poverty Reduction Program has undergone significant improvement and refinement. Whereas it was originally proposed as a set of 7 interlocking sub-programs, the updated program design has been simplified into a set of 5 connected services, designed with universal transferability and application to other communities in mind.

Program services are explained in the sections that follow:



This service provides a single coordinated intake process for program participants, with a special focus on households-at-risk who may be in need of acute and emergency services, underserved subpopulations, as well as those who can benefit from preventative services. A common assessment tool (VI-SPDAT[3] or similar) aids the intake and referral process, and encourages

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uniformity within and between communities. Using a trauma-informed service provision lens and specialized training, multiple system access points and outreach services refer new and existing clients to any community services they may require, including: protective; health; social; housing and emergency shelter; transportation; financial; employment; education and training; accessibility; and other related community and government services. Among these services are the services provided by the Energy Poverty Reduction Program.

Energy Poverty Reduction Program Architecture

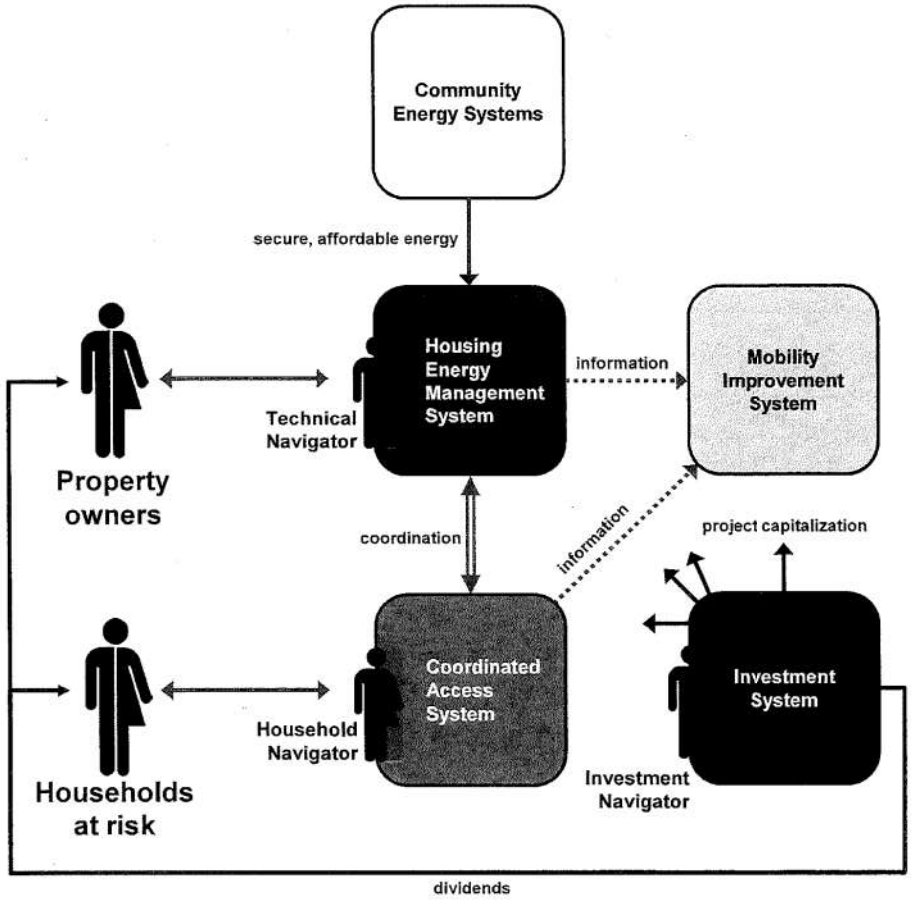


Diagram 1.2

The service consists of 2 sub-programs that are explained in detail in the **Performance Measurement chapter: Partnership Coordination, and Coordinated Access Service Provision.**

Communities that already have a Coordinated Access System in place can leverage those existing services.

Relationship to Data & Connected Technologies: we propose that this service make use of the nationally-accessible Homeless Individuals and Families Information System (HIFIS), hosted by Employment and Social Development Canada (ESDC), as its core data platform. This will facilitate data exchange with community service providers as well as the municipal data platform that will house the rest of the Energy Poverty Reduction Program. The use of this national database would also facilitate inter-community collaborations and performance metric comparisons.

[3] Developed by Org Code Consulting, this assessment tool is widely used in Canada for planning and prioritizing service provision to underserved populations particularly for housing and shelter needs. The tool is already in use in Bridgewater.

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Housing Energy Management System

This service provides property owners with turn-key energy monitoring, planning, management, retrofit, and financing services. Services address retrofits to existing housing stock, as well as services and incentives to support the construction of highly efficient new housing units. The target of the program is to achieve a universal energy performance improvement of the community's housing stock of approximately 60%, and to further supplement that with an additional 30% in renewable energy generation, for a total imported energy cost reduction of 90%. Individual energy performance targets will be set for participating properties as part of the client intake process, and will be updated periodically as new energy management solutions become available.

The service consists of 3 sub-programs that are explained in detail in the Performance Measurement chapter: **Program Coordination & Administration, and Housing Retrofits and New Construction.**

The service is designed to leverage existing municipal competencies in asset management and service provision. It also enables communities to leverage and stack existing and emerging energy efficiency programs, whether those have been implemented on the municipal, provincial, or federal levels. In Bridgewater's case, the programming offered through this service will build heavily on, and significantly expand, Efficiency Nova Scotia's energy efficiency services and financial incentives aimed at improving the province's housing stock.

Relationship to Data & Connected Technologies: existing municipal property and financial management software will be used as the core data platform for this program, with the addition of an Energy Management Information System (EMIS) module, and an expansion into Real Time Operations (RTO) functionality. The EMIS interfaces with a network of connected technology points to provide the core energy management functions of energy monitoring, forecasting, and control. The system's functionality is expanded gradually over time as new energy management solutions and community energy systems come online. In Bridgewater's case, the proposed data platform is TownSuite, the Town's current municipal management software.

Community Energy Systems

Supplementing energy improvements in individual homes, this service plans and develops neighbourhood and community-scale energy systems such as solar farms, district heating systems, and microgrids. These systems feed secure and affordable energy to participating properties, and earn dividends for their investors. The service consists of 2 sub-programs that are explained in detail in the **Performance Measurement chapter: Utility Grade Service Provision, and Neighbourhood & Community Scale Energy Systems.**

Communities with their own energy utilities can leverage those existing services to deliver these functions. As community-scale energy solutions will differ based on local and regional context, specific applications need to be tailored to the needs of individual communities. In Bridgewater's case, the community is in the process of exploring the development of its own energy utility, as well as the potential procurement of utility-grade services from an existing utility in the area. Feasibility studies for the selection and implementation of community-scale energy systems are included in the first few years of the program, with a 6MW "solar garden" as the preliminary choice for community-scale energy technology in this proposal.

Relationship to Data & Connected Technologies: community-scale energy systems are powered and controlled by connected digital systems, allowing for a new generation of advanced net-metering, microgrid, and local energy market applications. These functions can effectively integrate into the

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municipal property and financial management software described above.



This service receives information from the Coordinated Access System and the Housing Energy Management System to plan and implement mobility improvements based on community needs. As municipalities are typically responsible for neighbourhood and community-scale transportation systems, this service will typically integrate with and expand on existing municipal services.

The service consists of 2 sub-programs that are explained in detail in the **Performance Measurement** chapter: **Program Coordination & Administration, Transit System Improvements,** and **Active Transportation Improvements.**

Communities with their own road, trail, and public transit infrastructure would tailor this service to their own infrastructure and services, which may also include regional transportation planning. In Bridgewater's case, intra and inter-community public transit services and active transportation infrastructure improvements are the primary areas of focus, though paratransit and ride sharing services may eventually form part of the service planning model as well.

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Relationship to Data & Connected Technologies: mobility improvement planning efforts are enhanced by the use of data from the Housing Energy Management System and the Coordinated Access System through the use of spatial data and transportation network routing and planning, as well as mobility indicators and feedback from clients. These functions can effectively integrate into the municipal property and financial management platform.



This service funnels funds from investors into the services described above. Program investors are categorized into (1) social value investors, which include governments and charitable organizations, and (2) financial investors seeking a return on investments from housing and community energy systems. Using creative financing tools, property owners and households-at-risk can also become investors in the system and receive dividends.

The service consists of 2 sub-programs that are explained in detail in the **Performance Measurement** chapter, and expanded on in the **Financial chapter: Municipal Capitalization System, and Financial Investment Vehicle.**

This service builds on existing municipal competencies related to budgeting and asset

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We can't judge people like 'How did you forget your child's mittens today?' when there may be water coming in their window, the landlord may not be available; they may be cold, they may be hungry.

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management. Communities that work closely with external fundraising entities can leverage those relationships to build this system, and those municipalities that are permitted by legislation to use innovative capitalization strategies (e.g. community bonds or green bonds) may make use of those capitalization opportunities as well. In Bridgewater there is no existing Financial Investment Vehicle to leverage, so the implementation of this service includes a period of feasibility assessment and organizational development. Emerging energy financing services, including Energy Services Companies (ESCOs) are anticipated to play a significant role in the capitalization of these improvements both in Bridgewater and across the country.

Relationship to Data & Connected Technologies: financial planning efforts and investment opportunities are calculated and driven by the robust EMIS system that forms the core function of the program's data system. Financial planning and management for the

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program can effectively integrate into the municipal property and financial management software described above. External financial investment systems will rely on external data platforms. In Bridgewater's case the external platform still needs to be determined, though for planning and budgeting purposes, the MaRS Centre for Social Innovation's SVX platform is used as the placeholder system for this service.

The relationship between these revised programs and those described in the initial application are summarized in Table 1.4.

The restructuring of the Energy Poverty Reduction Program has significantly improved its implementation potential, as well as improved transferability, scalability, and replicability to other communities.

Original and Revised Program Components

Program Components As Originally Proposed (April 2018)		Revised Program Components
Theme 1: housing and transportation investments	Program A: local clean energy investment system	Investment System
	Program B: comprehensive retrofit improvement program for low-income homes and rental properties	Housing Energy Management System
	Program C: regulations and incentives for the construction of new high-energy-performing affordable rental units	Housing Energy Management System
	Program D: public transit and active transportation service and infrastructure improvements	Mobility Improvement System
Theme 2: resident engagement and capacity building	Program E: engagement program for residents*	Coordinated Access System and Housing Energy Management System
	Program F: clean tech sector trades training program for residents	N/A
Theme 3: partner collaboration and capacity building	Program G: data sharing and collaboration program for partner organizations	Coordinated Access System

Table 1.4 *Program F, the clean tech sector trades training program for residents, was found to be impractical at this time, as local trades training organizations were unable to commit to trades training outcomes and timelines. Instead, the Nova Scotia Community College has provided a letter (see **Appendix**) indicating its ongoing support for the Energy Poverty Reduction Program, and its willingness to explore integration with its Work Integrated Learning courses, the Women Unlimited program, and participating in the Coordinated Access System in order to provide information, where applicable, around training opportunities. The College continues its interest in the creation of new programming options in the areas around Green Energy and Technologies, but this will require additional study and development before the College is able to confirm its offerings.

INNOVATIONS SUITABLE FOR NATIONAL DEMONSTRATION

This high-impact, comprehensive approach to community-based problem solving and transformational change is highly transferrable to communities across the country that are struggling with energy poverty challenges. As the world shifts its energy systems, these transitions will be inherently challenging as economic disruption occurs and less affluent Canadians are saddled with the remnants of outdated or legacy energy systems, whether those are housing technologies or energy systems from the last century. Municipalities are uniquely positioned to take advantage of emerging energy systems, pairing them with data and connected technologies, and delivering robust and accountable services that improve affordability and quality of life for historically underserved populations. In this way, municipalities can play a critical new role in facilitating a transformation for our communities, especially their most vulnerable members, through the coming energy shift.

By selecting Bridgewater as the winner in the $5 million Smart Cities Challenge prize category, Canada will support a powerful new demonstration of technology-enabled community-based problem solving to its stated objectives of addressing both the poverty crisis and the climate crisis at the same time.

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PERFORMANCE MEASUREMENT OVERVIEW

To support the ambitious scope and complexity of Bridgewater's Energy Poverty Reduction Program, we have developed a methodical implementation and performance measurement schedule. The following section outlines the activities and outputs, including deployment schedule and anticipated deliverables for each of the 5 systems that form the overall Energy Poverty Reduction Program: Coordinated Access; Housing Energy Management; Community Energy; Mobility Improvement; and, Investment.

An evaluation framework is proposed and detailed in Table 2.9. A logic model consisting of activities, outputs, and outcomes has been developed to guide the implementation process and allow for ongoing evaluation of program performance and quality. This logic model is illustrated in Diagram 2.1. Table 2.10 details the program outcome indicators, associated measurement methodologies and tracking systems.

Risks associated with the Energy Poverty Reduction Program are comprehensively described in the **Project Management chapter,** which also includes the risk management strategies and associated course correction checkpoints for the program.

PROPOSED PHASING AND PAYMENT SCHEDULE

As detailed in the **Project Management chapter,** progress toward our outcomes are being consistently monitored and measured. To implement the program and achieve the outcomes described above, we propose to receive Infrastructure Canada's grant contribution in 3 installments that are closely tied to the program budget. The contribution amount will cover core program costs (development, administration, and operations, minus any municipal in-kind contribution).

The Energy Poverty Reduction Program consists of a set of 5 interconnected systems that will be deployed in 4 phases; each building off each other with some overlap in the early phases. As a small community with limited resources and no ability to draw significantly from the tax base to implement the program's development, administrative, and operating costs, we propose that each contribution will be provided up-front for the next phase of work to avoid incurring project losses or debt. Therefore, the first contribution will be at the start of the project, while the second and third contributions will be tied to achieving program outputs for Phases 1 and 2, respectively. Table 2.1 describes the timing of phases, core program costs, contribution amounts and the number of households served. Households-at-risk are less likely to also be the property owner. So the number of households served will account for both the inhabitants and the property owners. Program phases:

- **Prototype Program Setup -** This phase includes partnership and governance development; detailed service and technical design; service procurement; client consultation; establishment of risk management and quality control systems and the evaluation framework; as well as a comprehensive Privacy Impact Assessment (PIA) on the detailed program design and an overarching privacy policy.

- **Prototype Program Testing & Refinement -** This phase involves a gradual ramping up of client intake; continuing design and implementation of services and technologies; and monitoring and evaluation of results. Program outcomes become measurable by the end of this phase.

- **Final Program Activation -** This phase requires the finalization of program service design and technical components; extensive documentation of program outcomes; and the development of learning materials for other communities and senior governments. The completion of the Final Program Activation phase marks the end of Smart Cities Challenge contribution agreement.

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Program Phases, Core Costs, Contribution Conditions, and Households Served by Fiscal Year

Fiscal Year	2020-21 Year 1	2021-22 Year 2	2022-23 Year 3	2023-24 Year 4	2024-25 Year 5	2025-30 (5 years) Long-term
Phase	1. Prototype Program Setup					
		2. Prototype Program Testing & Refinement				
					3. Final Program Activation	
						4. Program Maturity
Core Program Costs Plus Contingency	$1.4 million	$1.25 million	$0.75 million	$0.8 million	$0.8 million	
Contribution Request	$2.65 million at start of year		$1.55 million at start of year		$0.8 million at start of year	
Proposed Contribution Conditions	None		Phase 1 outputs achieved		Phase 2 outputs achieved	
Households Served	0	50	75	100	125	750 over 5 years
Relationship to Smart Cities Challenge (SCC)	Within SCC Program & Funding					After SCC

Table 2.1

Coordinated Access Service Provision Activities and Outputs

Activity	Year 1	2	3	4	5	long term	Outputs
Detailed program design							• program design complete
Staff hiring & training							• staff hired & trained
Database setup							• data platform created
Program established and serving clients		50 clients	75 clients	100 clients	175 clients	750 clients	• Clients (households and/or property owners) served by program
IT system maintenance							• data and IT systems maintained (ongoing)

Table 2.2

- **Program Maturity -** This phase includes ongoing client intake; program evaluation and improvement as well as the integration of new and emerging community energy technologies and solutions.

Coordinated Access System

PROGRAM ACTIVITIES AND OUTPUTS

COORDINATED ACCESS SYSTEM PROGRAM ACTIVITIES AND OUTPUTS

This program pulls together the partner organizations and service providers required to design and deliver a successful Coordinated Access System. It also maintains relationships and information sharing between the partners. As a service that will be contracted out to a qualified third-party organization, the Town of Bridgewater will work collaboratively with its community partners to develop the scope of the service, and to establish quality control parameters and performance metrics. In doing so, we will work closely with experts and expert organizations in this field, including provincial and national agencies with interests and expertise in coordinated access services.

- **Partnership development:** partner agencies will be brought together and will sign a memorandum of understanding for engaging in the Coordinated Access System.

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Partners will be consulted through a series of workshops on the service model, process work flow, and governance structure. Existing community collaborations to leverage include the Lunenburg County Community Hub which already brings together a wide spectrum of government and non-profit service providers in a coordinated continuum of practice to support early intervention and health promotion efforts as well as to coordinate case care.

- **Program evaluation & improvement:** partners participate in ongoing program evaluation and improvement, with key service delivery partners actively participating in the evaluation process (see Overall Program Management later in this section). Evaluation will lead to periodic adjustments to the processes, policies and procedures of the service. Evaluation processes will be led and supported by staff and will involve client feedback on a regular basis.

Third party service providers will participate in an open procurement process for the provision of this service. Starting with a request for expressions of interest and culminating in a long-term service agreement, the Town of Bridgewater and its partners will assess service providers' expertise, capacity, and ability to deliver quality services that match the desired program scope. Service provision for this program may be paired with, and enhanced through, provision of Coordinated Access Services to a larger clientele than is envisioned through the Energy Poverty Reduction Program (e.g. for clients outside of Bridgewater). However, sufficient capacity and funding will need to be evident to ensure that program quality is maintained. Client services begin in 2021-22, and increase annually for each of the 3 remaining program years until the program reaches its mature state. The program partners will work closely with the service delivery organization to ensure that program quality is maintained; that information sharing and privacy obligations are met; and the program outcomes are being achieved.

- **Detailed program design:** building on the scope of work for the procured services, the service delivery partner will undertake the comprehensive design of the Coordinated Access Service. Specialized partners may be engaged in this stage, such as the Family Service of Western Nova Scotia or the Affordable Housing Association of Nova Scotia, both of which are currently active in developing coordinated access systems for their constituencies.
- **Staff hiring & training:** qualified staff, known in this program design terminology as the "Household Navigator(s)", will be hired and trained by the service delivery organization to support program design and to deliver the coordinated access service. Staff will be Clinical Social Workers who are licensed to practice in Nova Scotia. The service delivery partner will start by hiring 1.5 FTEs, which it will be able to expand to 2 FTEs by year 4. Staff will receive training in the specific clinical and administrative functions that will be required by the Energy Poverty Reduction Program, and they will be trained to use the program's data platform.
- **Database setup:** the Homeless Individuals and Families Information System (HIFIS) is readily customizable by service providers, and will be set up with the appropriate data entry forms and reporting forms required for the Coordinated Access System. As a free service with plenty of user support, this effort will be primarily carried out in-house by the Household Navigator(s), with an allowance for technical support and equipment (e.g. tablet computers for mobility).
- **Serve clients (2021 through 2030):** client service provision involves intake by the Household Navigator(s) from multiple referral points in the community, assessment and triage using a standardized intake tool (VI-SPDAT or similar), and referral to any and all community services the household may require. The Household Navigator maintains contact with

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each client, providing the level of supportive service the household requires. The Navigator maintains client information in the HIFIS database, and only shares limited information, with the client's permission, with the rest of the Energy Poverty Reduction Program.

- **IT system maintenance:** there will be ongoing maintenance of the HIFIS system database, data entry and reporting forms, and maintenance of equipment.

- **Communications & marketing:** the program partners will design and implement a Communications Strategy for the Coordinated Access System which will include the following: (1) creating a clear understanding among all partners facilitating coordination of how the Coordinated Access System will function and how to engage residents on the system; (2) roll-out and maintenance of the Communications Strategy to inform underserved populations of the system; (3) ongoing communications with partners and funders to communicate the outcomes and evaluation of the service.

Housing Energy Management System

HOUSING ENERGY MANAGEMENT SYSTE

PROGRAM ACTIVITIES AND OUTPUTS

Extensive analysis of Bridgewater's housing stock started with the Community Energy Investment Plan from 2016 to 2018. The analysis resulted in the classification of the housing stock into 32 "archetypes" based on the type, size, and age of the homes. A fully-costed retrofit program was conceptually modelled for the entire residential sector, using ambitious energy targets: greater than 50% thermal and electrical energy efficiency gains, plus the widespread addition of on-site renewables and battery storage. New construction targets were set at Net Zero Ready (NZR) or Net Zero (NZ), which the Government of Canada has established as long-term targets for the national Building Code.

The housing stock model was refined for the Energy Poverty Reduction Program. It adjusted the energy performance targets for retrofits to 60% efficiency improvement coupled with an additional 30% on-site or neighbourhood renewable energy generation. It also updated the capital costs for retrofits which were sourced from recent case data from local and provincial energy retrofit programs including the Clean Net Zero and Affordable Multi Unit Pilot programs. Connected technology solutions for both retrofits and new construction were added, and a redistribution of the housing archetypes based on extensive community surveying to identify the housing stock most affected by energy poverty was undertaken. All client properties will have access to the following energy management improvements, as long as they meet technical and financial feasibility criteria:

- On-site or neighbourhood renewable energy generation (solar hot water + solar PV)
- Highly efficient mechanical systems (targeting air source heat pumps)
- High levels of ceiling, basement and wall insulation, as well as a high degree of air sealing
- Energy efficient and smart appliances
- LED lighting
- Energy monitors, smart thermostats, and other connected technologies
- Energy management education and training

The housing infrastructure improvements function as the technical backbone of Energy Poverty Reduction Program. Energy efficiencies gained by the infrastructure improvements will be measured and monitored via the connected technology solutions discussed in detail in the **Technology chapter.** Energy and climate benefits calculated through our custom housing stock improvement model estimate 4.8 GWh of energy and 2.5 kilotonnes of greenhouse gas emissions (GHG) reduced by 2024-25, with an additional reduction of 10.1 GWh of energy and 5.9 kilotonnes of GHG emissions reduced by 2029-30 (cumulative).

- **Partnership development:** partnerships will be established with key players in the energy and housing landscape, including Efficiency Nova Scotia, Nova Scotia Power, the South Shore Housing Action Coalition, and a number

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Housing Energy Management System: Activities and Outputs

Activity	Year						Outputs
	1	2	3	4	5	long term	
Staff hiring & training							• staff hired & trained
Technical navigation services for clients							• technical navigation & support services provided
Detailed program design							• program design complete
Database setup - municipal enterprise resource planning (ERP) system							• data platform created
Database setup: energy management information system (EMIS)							• data platform created
IT system maintenance							• data and IT systems maintained (ongoing
Plan & implement retrofits and new construction		45/5	68/7	91/9	114/11	682/68	• units retrofitted/units constructed
Service & supplier procurement & coordination							• services & suppliers procured in cohorts (phase 2 onward) • performance management or procured services & suppliers (phase 2 onward) • dialogue and capacity building with related industries (phase 2 onward)
Community engagement							• clients consulted on design (phase 1) • clients consulted on prototype test (phase 2) • ongoing consultation with clients (ongoing)
Program administration							• program administration services delivered (ongoing)
Program evaluation & improvement							• program outputs and outcomes evaluated, and program improvements made (ongoing)

Table 2.3

of government agencies. Key among partner activities is the sharing of information related to energy solutions and costs. Partners may participate in the program Steering Committee, support the development, implementation, and evaluation of the program, and may provide services under contract to the program or the program's clients.

- **Staff hiring & training:** staffing for the program will consist of the following:
  - 1.5 FTE positions for the "Technical Navigator(s)" who will be technical staff with training and experience in building science and energy efficiency and at least one of whom will be a professional Engineer licensed to practice in Nova Scotia. Staff will receive training in the program's administrative and technical systems, and ongoing professional development related to community-based energy management services and large scale community energy systems.
  - 1 FTE position for an Information Systems Specialist who will support the design and management of the program data platforms including the Energy Management Information System (EMIS). Staff will receive training in related data management systems: TownSuite, EMIS, and Real Time Operations systems.

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- **Technical navigation services for clients:** services will be provided by the Technical Navigators to participating property owners. Services will begin with client intake and property registration, and depending on the property owner's needs, can involve a comprehensive suite of services including planning and assessment; monitoring and targeting; measurement and verification; performance verification; performance contracting; troubleshooting/ fault detection; risk monitoring and control; contractor coordination (turn-key services); auditing; financial planning; and energy management education services. Services will cater both to retrofits as well as to new construction.

- **Detailed program design:** led by program staff and guided by the program partners, a detailed program design will incorporate best practices in community-scale energy efficiency programming, with an eye to achieving deep energy retrofits and highly efficient new construction. Informed by leading programs in the region, from across Canada, and internationally, attention will be focused on ensuring program accessibility for clients, mitigating problems commonly faced by landlords, and on making use of emerging connected technologies such as smart submeters and smart thermostats to achieve desired energy efficiencies and related household energy savings.

- **Database setup - municipal enterprise resource planning (ERP) system:** we will work with our municipal data platform provider, TownSuite, to set up the Enterprise Resource Planning (ERP) system backbone to support the program. The ERP is described in detail in the **Technology chapter.**

- **Database setup - energy management information system (EMIS):** complementing the development of the ERP is the development of the EMIS module of the data platform. The module will interface with the ERP and provide the core energy monitoring and planning functionality of the program. Due to its complexity, the development of the core functionality of the EMIS will fully span Phases 1 and 2. The EMIS and its associated advanced functions (including real time operations systems) is described in detail in the **Technology chapter.** Technical risk involved with designing and deploying the EMIS system has been identified as a significant program risk, justifying the need for this time and effort. This is discussed in the Risk Management Section of the Project **Management chapter.**

- **IT system maintenance:** ongoing maintenance and licensing fees associated with the data platforms described above, and maintenance of equipment.

- **Service & supplier procurement & coordination:** the Technical Navigators will issue periodic calls for contractors and suppliers, collectively known as Energy Service Providers. Management of those procurements and contracts will require ongoing effort. Supply chain risk involved with procuring these services has been identified as a significant program risk, justifying the need for this time and effort.

- **Community engagement:** the Technical Navigators will be involved in engagement and consultation efforts with program clients (households-at-risk as well as property owners) both to inform program design and prototyping as well as for ongoing program evaluation.

- **Program administration:** administration of the program will involve ongoing program management, monitoring, reporting and human resource development.

- **Program evaluation & improvement:** partners participate in ongoing program evaluation and improvement, with

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key service delivery partners actively participating in the evaluation process (see Overall Program Management later in this section). Evaluation will lead to periodic adjustments to the processes, policies and procedures of the service. Evaluation processes will be led and supported by staff, and will involve client feedback on a regular basis.

- **Communications & marketing:** we will design and implement a Communications Strategy for the Housing Energy Management System which will include the following: (1) developing a marketing strategy to engage property owners and households-at-risk in the program, which will likely involve branding the program without the use of the term "energy poverty"; (2) roll-out and maintenance of the Communications Strategy to inform all clients of the service; (3) ongoing communications with partners and funders to communicate the outcomes and evaluation of the service.

RETROFITS AND NEW CONSTRUCTION

The Town of Bridgewater will engage partners to create a common vision informed by the community for the development of affordable, green, and accessible housing in Bridgewater. The Town will conduct a housing needs assessment to identify demographics, gaps in housing provision and existing housing stock. The Town will undertake steps to incorporate policies into Town plans to ensure affordable and energy efficient homes are a council priority. Regulatory structures and incentives will be put in place in accordance with recommended actions outlined in Bridgewater's Community Energy Investment Plan (2018). The Technical, Investment, and Household Navigators will provide service coordination for homeowners and those in housing need to access programs available through the Housing Energy Management System, Financial Investment Vehicle, and Coordinated Access System.

The Town will take several actions to incorporate policies, create regulatory incentive frameworks, and enable financing opportunities to ensure that retrofit and new construction meets the energy efficiency and affordability targets of our application. First, the Town's Municipal Planning Strategy (2014) will be amended to include policies for housing energy efficiency targets laid out in the Town's Community Energy Investment Plan (2018). This may include creating a specific energy efficiency overlay zone to incent retrofits, upgrades and building to higher standards than the current building code requires. Further polices will be added in support of mixed tenure, affordable housing congruent with existing policies for supporting the construction of a range of higher density, mixed-use infill development in the Town's core. The Town's criteria for evaluating proposals for land use by-law amendments and development agreements will be amended to ensure that staff and Council shall consider the energy efficiency and affordability of housing when making decisions.

As per the Town's Community Energy Investment Plan (2018) additional policies outside of the land use planning documents will be pursued. These include:

- Maintain and expand annual financing limits for Property Assessed Clean Energy Financing to incentivize property owners to build to a higher energy efficient standard, and explore opportunities to expand program eligibility to include multi-unit residential, commercial, and institutional buildings.
- Establish incentives to support and encourage highly energy efficient building practices for residential development.

In Nova Scotia, the responsibility for affordable housing lies with the provincial government through Housing Nova Scotia. Municipalities do not have a legislated requirement, but a societal expectation to provide for the needs of their residents and community. Bridgewater Town Council identified the need to play a stronger role in providing affordable housing well

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before the development of the Energy Poverty Reduction Program. But it did not have the broad community support for or deep understanding of the relationship between housing infrastructure, energy management and overall poverty to go beyond general policies of smart growth, residential infill and densification. Catalyzed by this deeper understanding of energy poverty, Council may develop policies to actively attract and support the development of affordable, energy efficient housing. This may include policies to facilitate the sale of town-owned land to a non-profit housing body for less than market value; and, to limit municipal taxes and/or fees for properties owned by a company or corporation established for the purposes of non-profit housing services.

The housing retrofit program will serve all major housing types in the community, including single detached, semi-detached, mobile home, and multi-unit resident buildings (MURBS). The Town's Community Development staff and the Technical Navigators will play a critical role in communicating these opportunities to property owners early in the development phase.

Community Energy Systems

COMMUNITY ENERGY SYSTEMS PROGRAM ACTIVITIES AND OUTPUTS

The development of utility grade services, either directly by the Town of Bridgewater, or procured through a third-party provider, has been selected as the most practical and economical pathway toward neighbourhood and community scale energy system development in Bridgewater. The activities described in Table 2.4 will be initiated by our technical project team (Project Coordinator, Technical Navigators, and Investment Navigator), with the support of externally-procured consultation and engineering services.

- **Technical resource assessment:** expanding on the preliminary work completed through the Community Energy Investment Plan, a detailed technical review of energy consumption and various energy generation sources (solar, wind, hydro etc.) will be assessed. This process will involve independent analysis of various renewable resources, and the cost to produce energy. Paramount to this step will be assessing fit between consumption patterns and renewable generation technologies, as poorly matched generation and consumption patterns can lead to technical and financial inefficiencies, and increase the requirement of energy storage.

- **Municipal utility detailed service design:** the first step of investigating and establishing a Municipal Utility Grade Service will be to establish the scope and design frame of this approach. In general, utility grade service can involve the generation, distribution and sales of electricity, data collection and assessment, and integration of connected technology such as demand control, sensors and energy storage. This first step will involve both a technical and a legal/regulatory review to define scope, best practices and to specific regulations and applications required.

- **Municipal utility setup and/or service procurement:** the most important part of this scope will be facilitating agreement with the incumbent utility, Nova Scotia Power. While the scope of utility service provision can vary significantly, there will always have to be a significant interaction with NS Power at the point of interface. This discussion would include such items as transmission and distribution system access, top up and spill provisions, emergency response, grid ancillary services and administration. The commercial terms of this agreement will have a major impact on the financial variability of power generation and sales in the community. An additional aspect to this set up process is determining the entity that performs this service. Three options exist: (1) expand existing municipal utility, (2) new stand-alone new municipal utility, and (3) a public-private partnership (P3)

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arrangement for service provision to a municipal utility.

- **Legislative and regulatory approval process:** while the regulatory process is defined, agreements will have to be in place with NS Power in order to proceed with any certainty through the application process. Of the three types of service noted above, only the generation and distribution of electricity is currently contemplated by the *Public Utilities Act*. Value added services through data and control of connected technologies such as demand control and energy storage would not require the regulatory process of establishing a municipal utility.

- **Database setup:** as detailed in the **Technology chapter,** the Energy Management Information System will be set up in such a way as to ensure future compatibility with community energy systems. While detailed IT integration in this regard cannot be completed until the time the specific technology is installed, a number of important functional components need to be prepared in the EMIS to enable this integration down the road.

- **Utility grade service management:** once all of the above is complete, Bridgewater will be in a position to offer utility grade energy services. With careful attention to financial considerations as discussed in the **Financial chapter,** work can begin in capitalizing the utility and providing service.

Community Energy Systems: Utility Grade Service Provision Activities and Outputs

Activity	Year						Outputs
	1	2	3	4	5	long term	
Technical resource assessment							• community-wide energy generation feasibility study complete
Municipal utility detailed service design							• utility grade services designed
Municipal utility setup and/or service procurement							• municipal utility established
Legislative & regulatory approval process							• legislative & regulatory approvals achieved
Database setup							• data platform created
Utility grade service management							• municipal utility services delivered (ongoing)

Table 2.4

SOLAR GARDEN DEVELOPMENT

The development of a community-owned "solar garden" has been selected as the preliminary technology for the neighbourhood-scale energy system for the Energy Poverty Reduction Program, as early assessments have suggested that such a system would lend itself well to delivering the outcomes proposed under this program. However, the final selection of the energy technology will be contingent on the outcome of the technical resource assessment described on the previous page. We are anticipating approximately 6MW of Community Solar Garden to be built in the first 5 years of our program. This will start in year 3, and supply the remaining load from the Housing Retrofit homes as well as 75-200 additional customers per year from the community. Each annual addition of solar generation capacity would be financed, so that payments made by the customers would cover the loan on the project. More detail on this and ownership structures can be found in the in the **Financial chapter.**

Conceptual design: a detailed assessment of the size and scale of the solar community garden would first be conducted. It would grow annually as more retrofits are completed. This stage

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would also consider if additional community participation to that of the neighbourhood retrofits could be considered. The end result of this stage should be a detailed financial proforma for each year's installation, along with the cumulative cashflows of the facility.

Fundraising & financing: this stage will span the project schedule from start to operation. Different types of financing will be available at different stages of project development. The various contracts with customers for the sale of power from the facility will be the key asset upon which the community entity can raise the equity and debt investment for the project. More information is available in the **Financial chapter.**

Community consultation: early and open transparency regarding project location, timelines, construction and environmental impact will be essential to this project's social acceptance. Open house style engagements have proven to work well with previous renewable energy projects in Nova Scotia of a similar scale (ie. COMFIT, SolarCity).

Detailed engineering design: once the concepts and project financing are established, detailed engineering design will take place. This will involve geotechnical, structural, and electrical design. There are many firms with local representation that have experience in design projects of similar sizes, and public procurement of these services will take place.

Permitting: permitting requirements for the project will include municipal, electrical utility and any additional environmental permissions.

Procurement: procurement will take place in stages as solar garden components are funded over 3 consecutive years. The market for renewable energy equipment is well established in Canada and globally. Costs can vary over time due to market efficiencies and changes in tariffs. Delivery schedule is usually tied to the placement of a firm order and can range from three months to two years, though for a smaller solar project 1-2MW in size at a time it is expected be on the shorter end of that timeframe. Placing an order for equipment will also require deposits to be paid.

Construction: the solar garden would be ground mounted with power generated collected to common points and connected to the NS Power electrical system. Major scopes of work for construction would be: (1) supply of panels and related equipment, (2) civil/roads, (3) structural (foundations and racking), electrical installation, and commissioning/testing. It is common that many of these scopes be combined into a generation contractor agreement, or an Engineer, Procure, Construction (EPC) contract.

Community Energy Systems: Solar Garden Development Activities and Outputs

Activity	Year						Outputs
	1	2	3	4	5	long term	
Conceptual design							• conceptual design complete
Fundraising & financing							• financing & funding targets achieved
Community consultation							• community consultants complete
Detailed engineering design							• detailed engineering design complete
Procurement							• services & suppliers procured
Permitting							• permits achieved
Construction							• construction complete
Database & IT systems setup							• IT systems installed
Commissioning							• commissioned
Operation & maintenance							• maintained (ongoing)

Table 2.5

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Database & IT systems setup: all modern community scale energy generation systems come with internet addressable controls systems. It will be important to ensure that data from this system can be integrated to the Town's EMIS. Generally, this interaction is undertaken with the solar technology provider.

Commissioning: the designer and installers of the solar garden will take on performance risk of the installation, to help make sure that the solar garden performs properly before the Town and the project investors accepts the installation in to operation.

Operation & maintenance: modern solar energy systems come with 25 year warranties on panels, and 10 years+ on other components such as racks and inverters. The community solar garden will contract for spare parts provisions and maintenance service provision, as well as for operational oversight.

Mobility Improvement System

MOBILITY IMPROVEMENT SYSTEM PROGRAM ACTIVITIES AND OUTPUTS

This service receives client mobility information from the Housing Energy Management System through the Technical Navigators, and from the Coordinated Access System through the Household Navigators, and uses it to plan and implement transportation improvements in the community. Implementation of improvements must be approved by Town Council through annual budgeting processes, and if approved are implemented by the Bridgewater Transit system and Engineering Department. While the program is focused on transit and active transportation modes at this time, future integration with rideshare and paratransit services is a real possibility that would be further enhanced through the planning functionality provided by this program.

- **Detailed program design:** planning staff will work with community partners to finalize the program scope and develop its technical methodologies. This will take place over a two-year timeframe to ensure integration with the overall program data platform, and to involve the first year of program clients directly in the design process.

- **Partnership development:** partnerships will be established with key players in the transportation and accessibility landscape, including members of the Bridgewater Active Transportation Committee, a standing Committee of Council with strong ties to community service providers.

- **Database setup:** the municipal enterprise resource planning components of the municipal data platform will be expanded to include a Client Mobility Application module. This will link with the existing Land Management GIS module to enable transportation planning through the use of spatial data from other parts of the system. Specifically, the civic addresses of program clients will be linked with transit and active transportation routing maps, and made to perform transportation planning calculations, including walking distance to the nearest bus stop and sidewalk or trail network. Mobility indicators are tracked by neighbourhood, with the goal of seeing improvement over time as enhancements are made.

- **IT system maintenance:** ongoing maintenance and licensing fees associated with the data platforms described above, and maintenance of equipment.

- **Community engagement:** staff will be involved in engagement and consultation efforts with program clients (households-at-risk as well as property owners) to inform program design and prototyping as well as for ongoing program evaluation.

- **Communications & marketing:** we will design and implement an

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Mobility Improvement System: Program Coordination & Administration Activities and Outputs

Activity	Year						Outputs
	1	2	3	4	5	long term	
Detailed program design							• program design complete
Partnership development							• partnership established
Database setup							• data platform created
IT system maintenance							• data and IT systems maintained (ongoing)
Community engagement							• clients consulted on design (phase 1) • clients consulted on prototype test (phase 2) • ongoing consultation with clients (ongoing)
Program administration							• program administration services delivered (ongoing)
Program evaluation & improvement							• program outputs and outcomes evaluated, and program improvements made (ongoing)

Table 2.6

improved Communications Strategy for the community's transit and active transportation systems, which will include the following: (1) developing a marketing strategy to engage residents in the program, which will build on engagement recommendations from the renewed Active Transportation & Connectivity Plan; (2) roll-out and maintenance of the Communications Strategy; (3) ongoing communications with partners and funders to communicate the outcomes and evaluation of the service.

- **Program evaluation & improvement:** partners participate in ongoing program evaluation and improvement, with key service delivery partners actively participating in the evaluation process (see Overall Program Management later in this section). Evaluation will lead to periodic adjustments to the processes, policies and procedures of the service.

TRANSIT SYSTEM IMPROVEMENTS

Bridgewater Transit has been operating successfully since 2017. As a new municipal service, improvements to transit routing and service delivery have been occurring on a regular basis. The transit service can benefit substantially from the enhanced planning functionality provided through this program.

Transit service improvement planning includes: making periodic routing adjustments, improving transit service accessibility, quality improvement measures, improvements to communications and marketing systems, and the integration of connected technology functions to the bus service. Already, a GPS locator in the bus allows for real-time tracking of the bus for the public. Additional service and communication enhancements based on connected technologies may include the development of client notification, survey, and complaint functions, as well as opportunities to provide real-time transit information to service providers including agencies that support under-served residents. Transit improvements are subject to Council approval on an annual basis. Transit service improvements will be documented and evaluated on an ongoing basis.

ACTIVE TRANSPORTATION IMPROVEMENTS

Active transportation planning and evaluation efforts can benefit substantially from the enhanced planning functionality provided through this program. Active transportation improvements will build on the recommendations and solutions provided through Town's Active Transportation and Connectivity Plan, which was developed in 2008 and which will be comprehensively renewed in 2019.

The nature of AT infrastructure improvements will depend entirely on the neighbourhoods that

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are selected for priority improvement. A budget has been proposed that represents approximately double the Town's current annual budget for these annual improvements. The budget allows for a combination of neighbourhood-based AT improvements, such as the installation of new sidewalks, replacement or upgrade of existing sidewalks, improved crosswalk paint and accessibility infrastructure, the addition of lighting in underlit areas, and making improvements to the Town's trail systems. AT improvements are subject to Council approval on an annual basis. Improvements will be documented and evaluated on an ongoing basis.

Investment System

MUNICIPAL CAPITALIZATION SYSTEM

This system provides core financial budgeting and capitalization services to the other program services. It is responsible for "specialized finance" stacking, assembling project opportunities and outcomes, and reporting to funders. It interfaces closely with the Financial Investment Vehicle, which brings additional private investment into the program. This program is explained in detail in the **Financial chapter** of this proposal.

- **Detailed program design:** program design will be carried out primarily by the Investment Navigator with the support of the program partners. Program design ensures that both the municipal capitalization system and the financial investment vehicle systems work cohesively and with fluidity. In order to do so, workflows and timelines need to be well-established. Focus groups and a gap analysis will determine the missing capacity to deliver on investment system outcomes, and controls designed to ensure operations do not derail.

- **Database setup:** the municipal database is to be defined and created in parallel with the detailed program design. The municipal enterprise resource planning platform will allow this financial budgeting and reporting functionality. Database requirements will be clearly articulated to the development team, and the developer and Town will correspond throughout the development process. The developer will receive a list of necessary components, and a testing team composed of various stakeholders, both internal and external to the Town, will be sourced to test its functionality.

- **Staff hiring and training:** staffing for this service will consist of 1 FTE position for the "Investment Navigator" who will have training and experience in financial management, analysis, and budget development, with preference given to someone with a background in large scale project finance and investment and an interest in the clean tech-sector and project-aligned social values. Staff will receive training in the program's administrative and technical systems, and ongoing professional development related to community-based financial planning services.

- **Partnership Development:** partnerships will be developed with three key groups: funders, investment vehicle services, and community capacity building organizations. The Investment Navigator will approach federal, provincial, and philanthropic funders to ensure robust funding streams are explored. Investment vehicle service partners are needed to set up and deliver the external investment vehicle described below. Community capacity building partners include local credit unions that are willing to act as financial literacy support organizations for program clients. Partners may participate in the program Steering Committee, and will support the development, implementation, and evaluation of the program.

- **Project financial planning:** on an ongoing basis, staff will calculate funding requirements for projects defined and projected by the Energy Poverty Reduction Program, and pool together project components into capitalizable groupings that are attractive

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to traditional, community, and specialized investors. This budgeting exercise will be facilitated by partnership opportunities established through partnership development activities and will rely on the database module developed for the program. Dynamic data sharing with the Financial Investment Vehicle is a key activity throughout the planning stage.

- **Plan, confirm and administer funding (2021 through 2030):** once specific projects are identified and pooled into groups, the Investment Navigator seeks specific funders to commit to those investment raises, until funding targets are met. Understanding that most funders operate on annual budgets, a recurring approach to raising specialized sources of capital will be undertaken. Annual administrating tasks include updating the database and reconciling accounts.

- **Reporting to funders:** reporting will be automated to the greatest extent possible to allow for real-time monitoring of project outcomes specifically pertaining to funding obligations. It is expected that each source will require different reporting criteria and on different schedules. These activities will be administered by the Investment Navigator.

Investment System: Municipal Capitalization System Activities and Outputs

Activity	Year						Outputs
	1	2	3	4	5	long term	
Detailed program design							• program design complete
Database setup							• data platform created
Staff hiring & training							• staff hired & trained
Partnership development							• partnership established
Project financial planning							• project financial planning completed (ongoing)
Plan, confirm, and administer funding 2021-30		$1.71	$2.28	$3.03	$3.83	$25.82	• millions raised in project funding from specialized investors
Reporting to funders							• project reporting needs satisfied (ongoing)
IT system maintenance							• data and IT systems maintained (ongoing)
Program evaluation & improvement							• program outputs and outcomes evaluated, and program improvements made (ongoing)

Table 2.7

- **IT system maintenance:** ongoing maintenance and licensing fees associated with the data platforms and maintenance of equipment.

- **Program evaluation and improvement:** partners participate in ongoing program evaluation and improvement, with key service delivery partners actively participating in the evaluation process (see Overall Program Management later in this section). Evaluation will lead to periodic adjustments to the processes, policies and procedures of the service. For example, it is expected that new technologies, financing mechanisms, and funding sources will evolve throughout the 10-year program and arrangements that were once not well suited may become more feasible over time. Evaluation processes will be led and supported by the Investment Navigator, and will involve client feedback on a regular basis.

FINANCIAL INVESTMENT VEHICLE

This program complements the Municipal Capitalization System but is external to the Town of Bridgewater, with services procured through

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an existing or new organization. The program is responsible for traditional financing (inclusive of community investments), cash disbursements through outcome-data shared by the municipal capitalization system, investing in energy poverty reduction program assets, and reporting to investors. This program is explained in detail in the **Financial chapter** of this proposal.

Investment System: Financial Investment Vehicle Activities and Outputs

Activity	Year						Outputs
	1	2	3	4	5	long term	
Investment vehicle organization creation and/or service procurement							• investment vehicle organization created
Administration & Reporting							• administration & reporting services delivered (ongoing)
Plan, sell, and administer investment raise 2021-30		$0.74	$7.69	$9.0	$8.86	$10.78	• millions raised in project financing from financial investors

Table 2.8

- **Investment vehicle organization creation and/or service procurement:** an organization that provides the best value to the Town and the Energy Poverty Reduction Program is procured. Target services include: the ability to set up community-based investment vehicles and organizational structures (see **Financial chapter** for details) the capacity to source traditional and community financing, adherence to appropriate best practices, and utilization of a comprehensive data-security and privacy plan. A unique organizational structure must be incorporated, appropriate bylaws must be drafted, and a governance structure that aligns with the Town's needs must be set up. Once sourced or built, an agreement with the Town must be drafted and executed. To support this service procurement process, financial investment vehicle and investor-related service delivery partnerships will be explored early in the partnership development process. For the purpose of this application the MaRS Centre for Impact Investing, whose SVX platform connects investment opportunities with impact investors, is being considered as a useful template for this service.

- **Administration and reporting:** Reporting should be automated to the greatest extent possible and allow for real-time monitoring of project outcomes specifically pertaining to what the funding source needs to access. It is expected that each traditional source will require different reporting criteria and varying schedules. These activities and the deployment of funds will be administered by the organization with data shared between the Municipal Capitalization System and the Financial Investment Vehicle.

- **Plan, sell, and administer investment raises (2021 through 2030):** activities are dependent on the two financing streams: traditional and community. Both require separate offering terms, due diligence activities and marketing narratives. The organization will be responsible for sourcing traditional debt investments paired with equity raises. These raises will be enhanced through third-party data and connected technology applications. Raising funds involves the development of a marketing strategy, inclusive of buying cycle projections, an elevator pitch and lead nurturing strategies. Investor onboarding activities continue throughout the "raise" and "manage" cycle and include subscription processing, and investor and financial institution correspondence. Monitoring investor satisfaction is a key component to ensuring investment raises are sustainable year-to-year. Additional information is provided in the **Financial chapter.**

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EVALUATION MODEL

In the Energy Poverty Reduction Program, there are multiple stakeholders and partners, a need to make quick decisions, prototyping of new programs, and high levels of uncertainty. Developmental evaluation is appropriate for this type of work because the governance and management team are ready and willing to test new approaches and make changes along the way to reach the goal of energy poverty reduction. Using these evaluation methods will allow the opportunity to blend qualitative and quantitative reporting.

As the evaluation process will be in tune with the evolving program dynamics, achievements, and struggles, it also plays an important role in the design and implementation of the program's risk management strategy and associated course correction checkpoints, which are described in the **Project Management chapter.**

Overall Program Management: Evaluation Framework

Phase	1: Prototype Program Setup	2: Prototype Program Testing & Refinement	3: Final Program Activation	4: Program Maturity
Ongoing Project Evaluation Priorities		• Continuous reflection of role clarification • Partner relations • Guiding principles • Project structure	• Quality of learning cultures • Existing and new project teams • Responsiveness • Moments of innovation	
Phase-Specific Evaluation Priorities	**Design by Core Team** • Partners – clarification of roles • Identify and build relationships with individual champions • Identify expertise of identified partners • Identify guiding principles and clarity of project charter • Leverage historical experiences • Establishment of project structure • Encouraging and identifying innovations in project design	**Early Changes** • Highlight new and emerging leadership • Consider internal and external creative tensions • Revisit guiding principles • Review lessons learned • Review and adapt project structure • Document innovations from prototyping • Consider emerging risk • Scaling project • Anticipate blocks to progress	**Systems Changes** • Revisit guiding principles • Review and adapt project structure • Leverage learned innovations • Establishment of ongoing project charter • The establishment of ongoing structure	**Population Changes** • New partners: funding, human resources, skills, leadership. • Operationalize the innovations
Desired Outcomes	• Project charter providing useful guidance • Core team/participants report feeling engaged in project • Systems to direct the project are established and useful	• New collaborations consistent with Guiding Principles are established • New funding and financing opportunities are identified • The practical usefulness of data collection systems are improved	• New resident and partner-informed programs and process are developed • New volunteer and agency leadership is engaged • Local collaborations to sustain impact post project are established	• Reducing Energy Poverty is considered a local 'movement' rather than a project • Residents pulled out of energy poverty are championing the impact • Local agencies, institutions and organizations are supporting counterparts in other jurisdictions to make changes to decrease EP.
Evaluation Outputs for Infrastructure Canada	• Phase 1 output report. Key output target: program governance, management, and evaluation systems in place	• Phase 2 output report • Phase 2 preliminary outcomes report	• Phase 3 output report. Key output target: Phase 3 program outputs and outcomes evaluated • Phase 3 final outcomes report	• Phase 4 output and outcomes reporting not applicable to Infrastructure Canada under this funding agreement

Table 2.9

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Energy Poverty Reduction Program Outcomes Logic Model

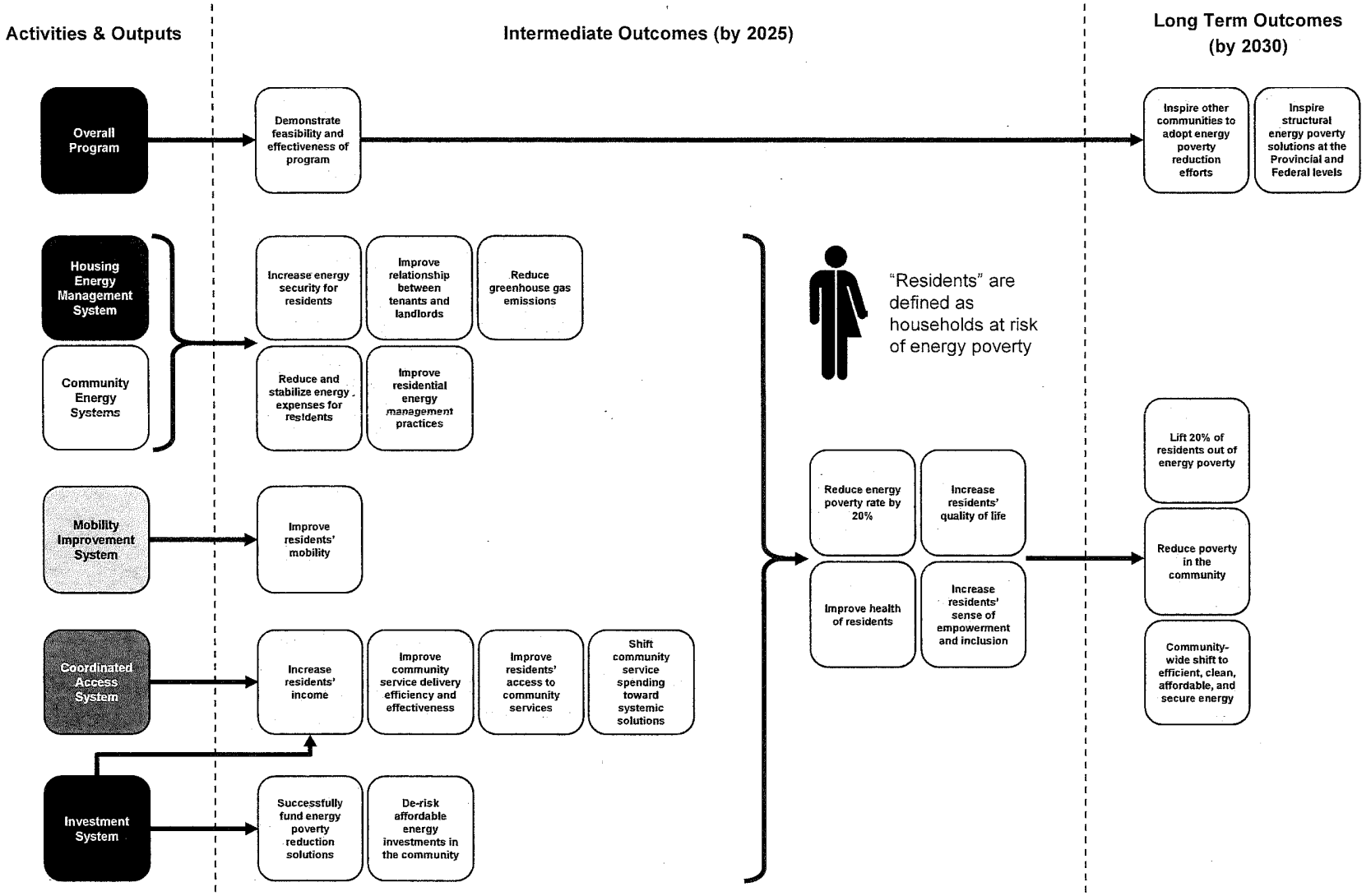


Diagram 2.1

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PROGRAM OUTCOMES AND INDICATORS

The program activities and outputs described in the preceding section are expected to result in a set of 22 intermediate and long-term outcomes that benefit the program clients, program stakeholders, the community as a whole, the environment, and ultimately communities beyond Bridgewater. Diagram 2.1 summarizes the Energy Poverty Reduction Program outcomes logic model. Outcomes displayed in the "intermediate outcome" section of the Diagram 2.1 will be demonstrated by 2025. While the benefits of these outcomes will continue to accrue past the Smart Cities Challenge program an additional set of 5 long-term outcomes are displayed in the final section of the chart, indicating our community's continued benefits from the program.

Indicators chosen for each outcome are meaningful, measurable and monitorable via data collected through the program itself, through regular community-wide surveys or from Statistics Canada census information.

Program Outcome Indicators and Associated Measurement Methodologies, Sources, and Tracking Systems

Outcome Category	Outcome	Performance Indicator	Baseline		Target		Methodology	Source	Tracking Program / System
			Year	Value	Year	Year			
Reduced poverty & improved wellbeing	1. Reduce energy poverty rate	Percent of households living in energy poverty	2018-19	38.5% (1,613 of 4,194)	2024-25	30.6% (1,362 of 4,452) = 20% rate reduction	Percent of households who self-report spending more than 10% of after-tax income on energy for the home and transportation and currently experiencing energy poverty. Measured through bi-annual community-wide survey. Percentages are based on projected future household growth as calculated in the Community Energy Investment Plan, with a basis in the 2016 Census.	Bi-annual community-wide Housing, Energy, and Transportation survey, to be conducted in 2028-29. Data stored on municipal platforms.	Overall Program
					2029-30	14.4% (660 of 4,577) = 62% rate reduction			Overall Program
	2. Reduce poverty	Percent of households living in core housing need	2016-17	27.9% (1,135 of 4,075)	2026-27	Decrease from baseline	Percent of households living in core housing need. A household is said to be in 'core housing need' if its housing falls below at least one of the adequacy, affordability or suitability standards and it would have to spend 30% or more of its total before-tax income to pay the median rent of alternative local housing that is acceptable (meets all three housing standards).	Census data (Statistics Canada). Target year will use 2026 Census.	Overall Program
	3. Improve health of residents	Amount of time program clients are able to meet their thermal comfort needs at home	Property intake year	Average property intake value	2024-25	Increase from baseline	Number of days per year that homes inhabited by program clients are sufficiently heated or cooled to a minimum level necessary for physical wellbeing. Subtracts the number of days that the temperature in main living area drops below 16 degrees C (threshold for respiratory illness) and 12 degrees C (threshold for cardiovascular illness), or above 27 degrees C (threshold for heat related illness) for a sustained period while occupants are home. Performance measured through change from baseline, pooled by property cohort (intake year).	Home energy monitoring system reports aggregated home temperature data. Data stored on municipal platforms.	Housing Energy Management System

Table 2.10

CONTINUED

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Outcome Category	Outcome	Performance Indicator	Baseline		Target		Methodology	Source	Tracking Program/ System
			Year	Value	Year	Year			
Reduced poverty & improved wellbeing	3. Improve health of residents	Thermal comfort of program clients	Client intake year	Average client intake score	2024-25	Increase from baseline	Overall thermal satisfaction over the past year, based on a scale from 1 (very dissatisfied) to 10 (very satisfied). Self-reported assessment by client households. Performance measured through change from baseline, pooled by client cohort (intake year).	Client wellbeing survey facilitated by Household Navigator. Initial intake, followed by periodic updates. Data stored on HIFIS.	Coordinated Access System
		Energy poverty-correlated population health index	2020-21	To be determined	2024-25	Improvement from baseline	Customized index of population health indicators to be designed and monitored by the Nova Scotia Health Authority using deidentified health system data. See letter of support.	Information to be collected and analysed by Nova Scotia Health Authority.	Coordinated Access System
	4. Increase residents' quality of life	Satisfaction of life in general for program clients	Client intake year	Average client intake score	2024-25	Increase from baseline	Satisfaction of life in general on a scale from 1 (very dissatisfied) to 10 (very satisfied). Self-reported assessment by client households. Performance measured through change from baseline, pooled by client cohort (intake year).	Client wellbeing survey facilitated by Household Navigator. Initial intake, followed by periodic updates. Data stored on HIFIS.	Coordinated Access System
	5. Increase residents' sense of empowerment and inclusion	Frequency of social contact for program clients	Client intake year	Average client intake score	2024-25	Increase from baseline	Percentage of time in the past year that the client reports contact 'once a week or more' with relatives and/or friends. Self-reported assessment by client households. Performance measured through change from baseline, pooled by client cohort (intake year).	Client wellbeing survey facilitated by Household Navigator. Initial intake, followed by periodic updates. Data stored on HIFIS.	Coordinated Access System
		Sense of belonging for program clients	Client intake year	Average client intake score	2024-25	Increase from baseline	Sense of belonging to the local community on a scale from 1 (very weak) to 10 (very strong). Self-reported assessment by client households. Performance measured through change from baseline, pooled by client cohort (intake year).	Client wellbeing survey facilitated by Household Navigator. Initial intake, followed by periodic updates. Data stored on HIFIS.	Coordinated Access System
	6. Increase energy security for residents	Amount of time program clients are able to meet their home energy needs	Property intake year	Average property intake value	2024-25	Increase from baseline	Number of days per year that homes inhabited by program clients are sufficiently powered, heated, or cooled to a minimum level necessary for physical and mental wellbeing. Performance measured through change from baseline, pooled by property cohort (intake year).	Home energy monitoring system issues alert on days that the home is unpowered or minimal thermal comfort levels are not met. Data stored on municipal platforms.	Housing Energy Management System

Table 2.10

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Outcome Category	Outcome	Performance Indicator	Baseline		Target		Methodology	Source	Tracking Program / System
			Year	Value	Year	Year			
Better Housing	7. Reduce and stabilize energy expenses for residents	Spending on shelter by program clients	Client intake year	Average client intake value	2024-25	Decrease from baseline	Total annual spending on shelter by program clients (as applicable: rent, mortgage, insurance, property tax, maintenance, utilities, and energy contracts). Self-reported assessment from client households. Performance measured through change from baseline, pooled by client cohort (intake year).	Client wellbeing survey facilitated by Household Navigator. Initial intake, followed by periodic updates. Data stored on HIFIS.	Coordinated Access System
		Affordability of housing energy costs	2018-19	37.4%	2024-25	Decrease from baseline	Percent of households who self-report having difficulty affording their home energy costs. Measured through bi-annual community-wide survey. Percentages are based on projected future household growth as calculated in the Community Energy Investment Plan, with a basis in the 2016 Census.	Bi-annual community-wide Housing, Energy, and Transportation Survey, to be conducted in 2024-25. Data stored on municipal platforms.	Overall Program
		Cost of home energy for participating properties	Property intake year	Average property intake value	2024-25	Decrease from baseline	Annual cost of all energy types consumed by homes inhabited by program clients, adjusted for annual climatic variability (heating degree days). Performance measured through change from baseline, pooled by property cohort (intake year).	Home energy monitoring system reports aggregated home energy consumption and cost data. Data stored on municipal platforms.	Housing Energy Management System
	8. Improve relationship between tenants and landlords	Level of trust between tenants and landlords - tenant perspective	Client intake year	Average client intake value	2024-25	Increase from baseline	Perception of trust in the landlord based on a scaled rating system on a scale from 1 (very low level of trust) to 10 (very high level of trust). Self-reported assessment from client households. Performance measured through change from baseline, pooled by client cohort (intake year).	Client wellbeing survey facilitated by Household Navigator. Initial intake, followed by periodic updates. Data stored on HIFIS.	Coordinated Access System
		Level of trust between tenants and landlords - landlord perspective	Property intake year	Average property intake value	2024-25	Increase from baseline	Perception of trust in the tenant(s) based on a scaled rating system on a scale from 1 (very low level of trust) to 10 (very high level of trust). Self-reported assessment from client property owners or their property managers. Performance measured through change from baseline, pooled by property cohort (intake year).	Property owner survey facilitated by Technical Navigator. Initial intake, followed by periodic updates. Data stored on municipal platforms.	Housing Energy Management System
	9. Improve residential energy management practices	Cost savings resulting from energy management practices for participating properties	Property intake year	Average property intake value	2024-25	Increase from baseline	Total annual cost savings as compared to baseline energy consumption resulting directly from energy management practices (manual + automated) as calculated by home energy monitoring & control system. Accompanied by a property owner & tenant survey on energy conservation practices that is used to illustrate / educate opportunities for improved energy management. Performance measured through change from baseline, pooled by property cohort (intake year).	Home energy monitoring system reports aggregated home energy savings data. Property owner survey & tenant facilitated by Technical Navigator. Initial intake, followed by periodic updates. Data stored on municipal platforms.	Housing Energy Management System

Table 2.10

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PERFORMANCE MEASUREMENT

Outcome Category	Outcome	Performance Indicator	Baseline		Target		Methodology	Source	Tracking Program / System
			Year	Value	Year	Year			
Increased Mobility	10. Improve residents' mobility	Community-wide transit ridership	2018-19	27,000 annual riders	2024-25	43,000 annual riders	Daily average transit ridership. Includes all passenger types.	Ridership counted hourly by bus drivers. Data stored on municipal platforms.	Mobility Improvement System (MIS)
		Mobility self-assessment rating by program clients	Client intake year	Average client intake value		Increase from baseline	Ease of mobility based on a scale from 1 (very low mobility) to 10 (very high mobility). Self-reported assessment from client households. Performance measured through change from baseline, pooled by client cohort (intake year).	Client wellbeing survey facilitated by Household Navigator. Initial intake, followed by periodic updates. Data stored on HIFIS.	Coordinated Access System
		Affordability of transportation energy costs	2018-19	25.5%	2024-25	Decrease from baseline	Percent of households who self-report having difficulty affording their transportation energy needs. Measured through bi-annual community-wide survey. Percentages are based on projected future household growth as calculated in the Community Energy Investment Plan, with a basis in the 2016 Census.	Bi-annual community-wide Housing, Energy, and Transportation Survey, to be conducted in 2024-25. Data stored on municipal platforms.	Overall Program
More effective community services	11. Improve residents' access to community services	Level of satisfaction with access to community services for program clients	Client intake year	Average client intake value	2024-25	Increase from baseline	Satisfaction with access to community services based on a scaled rating system on a scale from 1 (very dissatisfied) to 10 (very satisfied). Self-reported assessment from client households. Performance measured through change from baseline, pooled by client cohort (intake year).	Client wellbeing survey facilitated by Household Navigator. Initial intake, followed by periodic updates. Data stored on HIFIS.	Coordinated Access System
	12. Improve community service delivery efficiency and effectiveness	Self-assessment rating by Coordinated Access System partners	2020-21	To be determined	2024-25	Increase from baseline	Self-assessment rating using Coordinated Access System (CAS) Scorecard Guide which is a 23 question self-assessment tool to assist communities to take a snapshot local progress towards a quality Coordinated Access System.	Annual survey of coordinated access system partners facilitated by Household Navigator. Data stored on Coordinated Access System service provider server.	Coordinated Access System
	13. Shift community service spending toward systemic solutions	Percent of resources spent making emergency energy payments on behalf of clients, compared to other areas of support	2020-21	To be determined	2024-25	Decrease from baseline	Percent of annual dollars spent making emergency energy payments on behalf of clients, compared to other areas of support, for all service organizations that provide emergency energy funding for program clients.	Annual survey of coordinated access system partners facilitated by Household Navigator. Data stored on Coordinated Access System service provider server.	Coordinated Access System

Table 2.10

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Processed under the provisions of the Access to Information Act /Révisé en vertu de la Loi sur l'accès à l'information

Outcome Category		Performance Indicator	Baseline		Target		Methodology	Source	Tracking Program / System
			Year	Value	Year	Year			
Increased economic access & participation	14. Increase residents' income	Earnings from participation in energy systems by program clients	2020-21	To be determined	2024-25	Increase from baseline	Total annual dividends and other cashflow paid out to self-identified program clients from local energy investments.	Annual report on community investors produced by Financial Investment Vehicle. Data stored on Financial Investment Vehicle platform.	System
	15. Increase residents' participation in the green economy	Earnings from employment in the clean tech sector by program clients	Client intake year	Average client intake value	2024-25	Increase from baseline	Annual earnings from employment in the clean tech sector. Self-reported assessment from client households. Performance measured through change from baseline, pooled by client cohort (intake year).	Client wellbeing survey facilitated by Household Navigator. Initial intake, followed by periodic updates. Data stored on HIFIS.	Coordinated Access System
Achieved Climate Targets	16. Reduce greenhouse gas emissions	Greenhouse gas emissions from participating homes	Property intake year	Average property intake value	2024-25	Increase from baseline	Number of days per year that homes inhabited by program clients are sufficiently powered, heated, or cooled to a minimum level necessary for physical and mental wellbeing. Performance measured through change from baseline, pooled by property cohort (intake year).	Home energy monitoring system reports aggregated home energy consumption and emissions data. Data stored on municipal platforms.	Housing Energy Management System
	17. Community-wide shift to efficient, clean, affordable, and secure energy	Achieve the goals of the Community Energy Investment Plan	2016-17	2016 performance values	2024-25	Decrease from baseline	Key performance metrics articulated in the plan include: (1) community-wide energy consumption, (2) community-wide greenhouse gas emissions, (3) community-wide spending on energy, (4) community-wide investment in energy improvements, and (5) job creation resulting from energy investments. Implementation of the Energy Poverty Reduction Program will contribute strongly toward achieving these outcomes.	Annual indicator update by Planning & Recreation Department staff, and update of CEIP model and targets every 5 years. Data stored on municipal platforms.	Overall Program
Investment in communities	18. De-risk affordable energy investments in the community	Investment leverage ratio of capital improvement projects funded by the program	2020-21	To be determined	2024-25	To be determined	The ratio of all public instruments versus private sector investment in the program's capital projects (housing, transportation, and community energy systems). As both the costs of the public instruments as well as the energy investments occur over time, the present value of the costs and investments are used to calculate the investment leverage ratio. It is currently unclear what investment leverage ratio would be considered ideal for the program. This metric will be investigated during the program design stage.	Annual indicator update by Investment Navigator. Data stored on municipal platforms.	Investment System

Table 2.10

CONTINUED

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PERFORMANCE MEASUREMENT

Outcome Category	Outcome	Performance Indicator	Baseline		Target		Methodology	Source	Tracking Program / System
			Year	Value	Year	Year			
Investment in communities	18. De-risk affordable energy investments in the community	Carbon abatement cost of capital improvement projects funded by the program	2020-21 Property intake year	To be determined	2024-25	Decrease from baseline	The present value of the incremental costs of the energy project investments divided by the greenhouse gas emission reduction potential. Reported as dollars per tonne of carbon abated. Climate change mitigation indicator. This metric will be investigated during the program design stage.	Annual indicator update by Investment Navigator. Data stored on municipal platforms.	Investment System
	19. Successfully fund energy poverty reduction solutions	Funding and investments toward the program	2018-19	$250,000 Smart Cities Challenge finalist grant	2024-25	$45.7 million	Total funding and investments in energy poverty reduction program, including local investments and stacked funding (e.g. grants, rebates, etc.).	Annual indicator update by Investment Navigator. Data stored on municipal platforms.	Investment System
	20. Demonstrate feasibility and effectiveness of program	Achievement of program outcomes	2018-19	No outcomes achieved	2024-25	Phase 3 outcomes achieved, positive evaluation by partners and participants	Achievement of program outcomes, and evaluation by partners and participants. Measured though comprehensive evaluation process for program partners and participants.	Annual indicator update by program managers. Data stored on municipal platforms.	Overall Program
Demonstration of impact	21. Inspire structural energy poverty solutions at the Provincial and Federal levels	Government policies or programs have been influenced by the Energy Poverty Reduction Program model	2018-19	No reported instances yet	2029-30	Increase from baseline	Number of senior government articles of legislation, policies, or programs that have been definitively influenced by the Bridgewater program. Measured through information sharing with Provincial and Federal governments.	Annual indicator update by program managers. Data stored on municipal platforms.	Overall Program
	22. Inspire other communities to adopt energy poverty reduction efforts	Other communities in Canada have been influenced by the Energy Poverty Reduction Program model	2018-19	No reported instances yet	2029-30	Increase from baseline	Number of other communities in Canada that attribute all or part of their energy poverty reduction efforts to the Bridgewater program. Measured through information sharing with other communities.	Annual indicator update by program managers.. Data stored on municipal platforms.	Overall Program

Table 2.10

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GOVERNANCE STRUCTURE

As a municipal service, the Energy Poverty Reduction Program falls under Bridgewater Town Council's oversight, and under management of the Chief Administrative Officer (CAO). Final design and implementation of the program will be the responsibility of the Community Development Department, with a number of related functions taking place through other departments. The following elements are proposed within the governance and management structure:

- **Energy Poverty Reduction Program Steering Committee:** a formal Committee of Council that will provide advice to Council and staff on the design and implementation of the program. The Steering Committee will assist with maintaining community partnerships, and participate in program evaluation and quality review. It will participate, as appropriate, in client dispute resolution through an ombudsperson, and meet periodically with a Client Advisory Circle to receive client feedback. It is envisioned as a 6-10 member group, consisting of key program partners from the local community sector as well as regional organizations with expertise in energy and housing, such as Efficiency Nova Scotia. A member of Town Council will also sit on the Committee. Committee members do not receive compensation for their role through the Town, though some members may be paid staff from other organizations. The Committee will be resourced and supported by Town staff who coordinate and implement the program. A Terms of Reference for the Committee will be developed, and the Committee positions will be filled as one of the earliest activities in Phase 1.

> Collaborating as a group to help solve problems is often much more effective than organizations trying to do it on our own.
> – COMMUNITY SERVICE ORGANIZATION

- **Ombudsperson:** clients whose complaints about the program are not able to be resolved by program management may escalate their complaint to the Ombudsperson. This person is charged with representing the interests of program clients by investigating and addressing complaints. The Ombudsperson is recommended by the Steering Committee, and will be an external, independent expert with knowledge of the program. They will receive compensation for their work on a per diem basis. A role description for the Ombudsperson will be developed during Phase 1.

- **Client Advisory Circle:** prospective, current, and past clients of the program are recruited to participate in this advisory structure to provide periodic feedback to the Steering Committee and the program management team. The Client Advisory Circle is consulted on matters related to program design and implementation, quality, accessibility, affordability, fairness, and overall impact of the program. As the program clients include both households-at-risk as well as property owners, the Client Advisory Circle will represent both. Client Advisory Circle members receive a per diem to cover their participation, to reduce the risk that financial barriers will prevent effective participation. A Terms of Reference for the Client Advisory Circle will be developed as one of the earliest activities in Phase 1.

- **Technical Advisory Circle:** an ad-hoc working group that supports the program management team in the design and implementation of the program. The Technical Advisory Circle provides voluntary, independent, expert advice and project support to Town staff. A Terms of Reference for the Technical Advisory Circle will be developed as one of the earliest activities in Phase 1.

- **Program Coordinator:** the Community Development Department will put its staff

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in charge of the overall coordination of the program. The Energy Poverty Reduction Program Coordinator reports to Senior Manager and through the CAO to Town Council. This staff is also the main resource to the Steering Committee. As this coordination role is critical to all components of the program, the job description(s) for staff will be developed and/or updated, and any necessary hiring completed before Phase 1 begins.

- **Municipal Program Management:** day-to-day management of the 4 linked municipal services (the Housing Energy Management System, Community Energy Systems, the Mobility Improvement System, and the Investment System) will fall to municipal staff. Activities within each program will be a combination of staff effort and procured third-party services. Technical Navigators and an Investment Navigator provide services both to program clients and to program managers, while an Information Systems Specialist provides data management services within the program. Quality control and evaluation is carried out by staff, in partnership with the Steering Committee. Full descriptions of these positions will be developed before Phase 1 begins, and any necessary hiring will commence as one of the earliest activities of Phase 1.

- **The Coordinated Access System** will be managed by a third-party service provider with its own management and governance systems. Household Navigators are employed by the service provider. A partnership or service agreement defines the relationship between the Town and the external organization, as well as the responsibilities of both parties. See the **Performance Measurement Chapter** for a more detailed description of the service procurement process and anticipated timelines.

- **The Financial Investment Vehicle,** a sub-component of the Investment System, will be managed by a third-party service provider with its own management and governance systems. A partnership or service agreement defines the relationship between the Town and the external organization, as well as the responsibilities of both parties.

  See the **Performance Measurement chapter** for a more detailed description of the service procurement process and anticipated timelines.

The relationship between most of the governance and management structures described above are illustrated in the following in Diagram 3.1.



A Bridgewater resident views an exhibit on energy poverty at a Smart Cities Challenge Open House.

> It would help so that we wouldn't have to scurry around, one call request for assistance requires 8 other calls; if we would just network it would make it easier.
>
> – COMMUNITY SERVICE ORGANIZATION

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Program Governance and Management

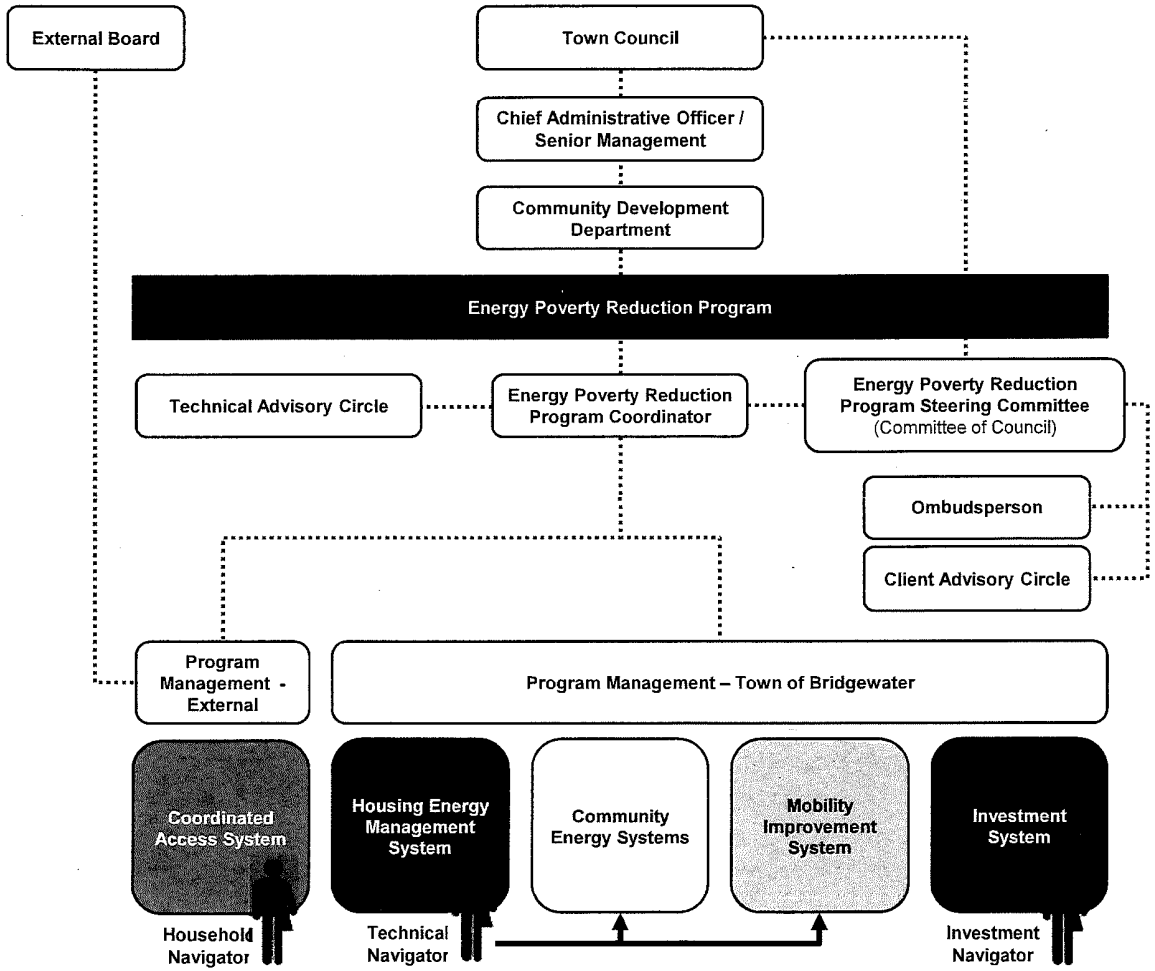


Diagram 3.1

EVALUATION, RISK MANAGEMENT, AND QUALITY CONTROL

Program staff will lead ongoing monitoring and reporting of program outputs as well as outcome indicators throughout all phases of the program. Monitoring and reporting responsibilities are divided by program, as defined in the **Performance Measurement chapter.** Performance measurement for activities that fall under "overall program management" are the primary responsibility of the Energy Poverty Reduction Program Coordinator, with the support of the Steering Committee. Annual reports will be generated for all program services, and shared widely with program stakeholders including Bridgewater Town Council. In its reports, staff will ensure that all identifying personal and business information is reported in aggregate unless express permission is given to share the information publicly.

See the **Engagement chapter** for information on how the program will maintain evaluation engagement with all its stakeholders.

All structures and members within the program governance and management system also have defined roles to play in the program's risk management and quality control processes. While risk management and quality control oversight ultimately rests with Bridgewater Town Council

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and the Chief Administrative Officer, the lead role for ongoing risk management and quality control activities will be delegated to program staff throughout all phases of the program. The risk management framework and quality control processes, including program governance risks, are described in the **Project Management chapter.** These activities will involve all other structures and members on a periodic basis, with additional involvement as needed. Key among these will be the Energy Poverty Reduction Program Steering Committee, which will be kept informed of emerging risk and quality control issues, and consulted on mitigation strategies.

PARTNER COMMITMENTS

We are pleased to report that a large and diverse group of program partners and supportive organizations have pledged their support for Bridgewater's proposed program. Partner commitments are described below, grouped by program service:

HOUSING ENERGY MANAGEMENT SYSTEM AND COMMUNITY ENERGY SYSTEMS

- **Green Power Labs** – Committed to the development and integration of the Energy Management Information System, engineering and integration of the real time operations (RTO) system, general technology development, and support and operations in the Town of Bridgewater up to 2030.
- **Efficiency Nova Scotia -** Committed to partnering on detailed program design and delivery of the Housing Energy Management System. This includes the provision of energy efficiency services and financial incentives for retrofits and new construction. Advisory support is provided through the Energy and Financing Working Group.
- **TownSuite Municipal Software** – Expressed interest in exploring the expansion of existing municipal software with the addition of an energy management information system (EMIS) module, with the eventual expansion into real time operations (RTO) functionality. Supportive of exploring the possibility of the enterprise resource planning (ERP) system backbone to support the program and develop the Client Mobility Application module.
- **Clean Foundation -** Committed to the provision of expertise, service delivery and design for the residential energy efficiency retrofit program. Clean Foundation will share data, and related financial and technical learnings of a recently piloted Net Zero retrofit program in Bridgewater.
- **Nova Scotia Power -** Nova Scotia Power will support access to the AMI and the Green Button initiative, offer financing for heat pumps for home retrofits, and provide support for connected technology solutions and applications, as well as expertise for charging stations for electric public transport.
- **St. Mary's University – Faculty of Science** – Committed to the provision of significant contributions in collaboration with Green Power Labs towards Big Data Management, Data Science, Machine Learning, and other aspects of Artificial Intelligence of the project.
- **Dalhousie University – Faculty of Computer Science -** The Smart City Research initiative of Dalhousie University is committed to partnering with Bridgewater to implement the Energy Poverty Reduction Program by providing advisory support. Advisory support is provided through the Energy and Financing Working Group.
- **Nova Scotia Department of Energy and Mines** – Committed partner on the implementation of the Community Energy Investment Plan and the Energy Poverty Reduction Program. Advisory support is provided through the Energy and Financing Working Group.
- **Affordable Energy Coalition** – Continued efforts to influence provincial policy and programs to further support energy poverty reduction efforts and inspire other communities to adopt Bridgewater's model. Further aid in knowledge sharing on how to best work with landlords in implementing energy retrofits.
- **Housing Nova Scotia** – Committed to exploring a partnership for upgrade

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referrals and continuing to provide up to date information on programs, funding, and housing stock. In addition, exploring a relationship to monitor and reduce the energy consumption of public buildings.

- **Ecology Action Center** – Committed to providing program education, advocacy, and engaging landlords in the proposed retrofit program.
- **Quality Urban Energy System of Tomorrow (QUEST)** – Prepared to disseminate program information to other municipalities through a Municipal Energy Learning Group and the QUEST NS Buildings Working Group. As one of five regional advisors for the Partners for Climate Protection program, QUEST will share replicable aspects of this program widely within the country. Committed to providing advisory support through the Energy and Financing Working Group.

MOBILITY IMPROVEMENT SYSTEM:

- **Nova Scotia Community Transportation Network** – Committed to promoting Bridgewater's transportation model to other rural communities in Nova Scotia and strengthening the network of relationships between non-traditional for-profit and non-profit community-based transportation providers.
- **Bridgewater Active Transportation Advisory Committee** – Committed to advising the town in its efforts to become an active transportation-supportive community, including putting an AT lens on town infrastructure, programs, policy and projects, and increasing partnerships promoting active transportation.

INVESTMENT SYSTEM:

- **New Dawn Enterprises** – Committed to potentially partnering with the Town of Bridgewater to establish a centralized CEDIF platform if it is selected as a community-investment tool. Advisory support is provided through the Energy and Financing Working Group.
- **Energy Services Association of Canada (ESAC)** – Members are committed to engaging in a competitive tendering process to demonstrate innovative ways to work with and be an integral part of Bridgewater's Smart City vision.

COORDINATED ACCESS SYSTEM:

- **Freeman House in association with Family Services of Western Nova Scotia** – Committed to partnering with the Town to administer the Coordinated Access System, provide guidance and support for system setup, on-going operations, communications, and in-kind support through staffing.
- **Nova Scotia Health Authority** – Committed to championing work within their networks and among community members through a Coordinated Access System, working with experts to develop an energy poverty index using health system data, and facilitating collaboration with other NSHA programs.
- **Nova Scotia Community College, Lunenburg Campus** - Committed to providing education and training opportunities through the Work Integrated Learning Programs, partnering with their Women Unlimited program to help showcase women in non-traditional trades and technology workplaces, integrating into a Coordinated Access System, and ultimately exploring the creation of new programming opportunities in the areas around Green Energy and Technologies.
- **South Shore Housing Action Coalition** - Prepared to support the program in an advisory capacity, engage its broad spectrum of members, and to support and facilitate the sharing of information about the project.
- **Service partners** committed to continued project engagement for the planning of a measurable, manageable and effective Coordinated Access System, and acting as referral and outreach agents, in the promotion, enhancing, and navigation of community resources through the system. These partners include: **Society St. Vincent de Paul; The Ark and Support Services Group;**

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Second Story Women's Center; Lunenburg County YMCA; United Way Lunenburg County; Salvation Army Bridgewater, N.S; South Shore Family Resource Center; Big Brothers, Big Sisters of South Shore; Be the Peace Institute; Bridgewater and Area Lions Club; Bridgewater Law Office (Nova Scotia Legal Aid); Nova Scotia Works; Bridgewater Food Bank; Family Support Center; Souls Harbour Rescue Mission, Bridgewater; SchoolsPlus; Small World Learning Center.

OVERALL PROGRAM SUPPORT

- **Halifax Regional Municipality –** Committed to sharing information on climate change related initiatives.
- **Government of Nova Scotia –** Committed to supporting the Town as a climate change leader.

Letters of support confirming all these commitments are provided in the Appendix. Additional letters of support that are confidential in nature because they contain sensitive market information are provided in the Confidential Annex.

DATA AND INFORMATION GOVERNANCE

Data and related infrastructure, along with the technologies and services for the Energy Poverty Reduction Program are key to the success, transferability and replicability of the program. Data governance must ensure that digital solutions both improve the liveability and wellbeing of the households-at-risk of energy poverty, and also meet democratic, privacy, and quality standards appropriate for a project of this scale.

At the core of municipal data governance lies the question of what communities can do in order to manage data in the best interest of their community members and the stakeholders at large without jeopardising privacy and security, and the potential business opportunities that lie within municipal data sets. This eventually leads to a fundamentally new form of public-private partnerships with data as the instrument. In developing this Energy Poverty Reduction Program, we have begun to develop a data governance policy which will need further refinement in the early stages of the program development. This needs to be undertaken in conjunction with the technology and data platform development process. This is discussed in further detail in the **Data and Privacy chapter.**

To develop a strong municipal data governance system for our Energy Poverty Reduction Program, the Town will be carefully considering the following questions and working with our community partners and participants to determine how we will manage the great deal of data and information sharing that is inherent in a smart cities approach.

- What strategies and approaches do communities need to follow to enable third-parties to share their data with the Town of Bridgewater?
- How can the Town remain the decision maker about data usage in public-private partnerships or in data-driven projects that impact the common good?
- What are the lines of decision making and how can the Town create transparent systems that show the existing trade-offs between public and private interests?
- What resources and skills are needed in Bridgewater to moderate data-related decision making?
- How can communities successfully initiate and steer pilot projects on municipal data?
- How do communities ensure ownership of the data in public contracts?
- What data should be provided as open data by the Town and how can communities arrive at a decision about this?
- How can communities embed their policy requirements in municipal data platforms?

The **Data and Privacy chapter** provides preliminary responses to the above questions. Additional work needs to be done during the detailed program design process to fully develop the Energy Poverty Reduction Program data governance framework. Concerns about data are detailed in the risk management section in the **Project Management chapter.**

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COMMITMENT TO INNOVATION AND ENERGY POVERTY REDUCTION

Over the past decade, the Town has been an active partner in multi-sectoral initiatives around topics as diverse and complex as food security, affordable housing, youth retention, health services planning, seniors safety, transportation, gender-based violence prevention, alcohol harm reduction, economic development, and a variety of community development initiatives.

The implementation of our ground-breaking Community Energy Investment Plan (2018) remains Town Council's key area of focus, and holds a priority status in the Town's Economic Development Action Plan (2018). The Town has publicly affirmed its commitment to implementing a broad spectrum approach to energy transition and energy poverty alleviation, including the new and innovative solutions that participation in the Smart Cities Challenge has helped us to identify and design.

PROJECT MANAGEMENT CAPABILITY

The Town of Bridgewater has worked hard to expand its highly qualified staff team to the point where it can confidently manage the detailed design and set up of the Energy Poverty Reduction Program. Initial lead staff on this file will include:

- Tammy (Crowder) Wilson, CAO. Tammy has over 20 years' experience in municipal government. She has worked on energy projects including wind energy and anaerobic digestion projects under the Nova Scotia's COMFIT program. She has also facilitated a partnership with the private sector to see landfill material turned into a marketable commodity and increase landfill diversion. Tammy has led the regionalization of some municipal services along the south shore, including participating in the development of several municipal corporations.
- Jessica McDonald, Director of Community Development. Jessica spent over a decade coordinating multi-sectoral environmental policy initiatives and programs for the Province of Nova Scotia. In Bridgewater, her accomplishments include stewarding the design and implementation of the Town's ambitious Pijinuiskaq Park and King Street streetscape enhancements, and overseeing the development of its first fixed route public transit service.
- Leon de Vreede, Sustainability Planner. Leon has managed the Town's sustainability program for over 10 years. Specializing in innovative planning, program design, and community engagement practices, Leon's work has been recognized by the Province of Nova Scotia through an inaugural Clean Climate Leader award in 2015, and by the Federation of Canadian Municipalities through his designation as a PCP Local Climate Change Hero in 2016. Leon will function as Program Coordinator for the proposed program.
- Greg Goubko, Energy Finance & Development Coordinator. Greg has spent the past 4 years working at the Toronto Renewable Energy Co-op/Tapestry Community Capital as the Community Investment Manager. He has recently joined the Town of Bridgewater to help with the implementation of the Community Energy Investment Plan and the Smart Cities Challenge project. He brings a wealth of knowledge related to community financing and local investment.
- Myles Cornish, On-Site Energy Manager. Myles is a Professional Engineer, working for Bridgewater under contract for Efficiency Nova Scotia. Aided by his extensive network throughout the Efficiency Nova Scotia organization as well as to external trade partners, Myles brings the core engineering expertise to the table that is needed to design and implement the infrastructure solutions proposed by the program.

Project management decisions will be made by the Director of Community Development and the CAO, and key decisions that affect town services (e.g. selection of technology partners, and key program design considerations) will be brought to Council for direction. The Steering Committee

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will review all project documentation (including staff-generated reports, RFPs and Terms of Reference, and consultant and legal reports) and provide feedback and guidance to staff throughout the process.

PROGRAM DEPLOYMENT

Lifting our residents out of energy poverty is an ambitious outcome outcome, which will many activities and deliverables along the way. A detailed discussion of the program activities and outputs (deliverables) are contained in the **Performance Management chapter** and includes a comprehensive list of indicators to help us measure and monitor our progress. Resource assessment for each element of the Energy Poverty Reduction Program is also discussed in that chapter. This includes details on program design, staffing, technology, partner and stakeholder engagement, procurement processes and needs, legislative and regulatory approvals, database and technology needs, administration, communications and evaluation. Costs associated with each program area, including the proposed use of the Finalist Grant, is provided in the **Financial chapter,** Tables 9.1 through 9.14. Strategies for engagement with partners, stakeholders, and target clients for the program are discussed in the **Engagement chapter.** This includes strategies for ensuring that our program is designed to be meaningful, fair and impactful for the broad range of residents who find themselves struggling to pay their energy bills in the face of all the other household priorities and hurdles.

The Energy Poverty Reduction Program consists of a set of 5 interconnected systems that will be deployed in 4 phases; each building off each other with some overlap in the early phases.

1 **Prototype Program Setup -** This phase includes partnership development; detailed service and technical design; service procurement; client consultation; a comprehensive Privacy Impact Assessment (PIA) on the detailed program design and an overarching privacy policy.

2. **Prototype Program Testing & Refinement -** This phase involves a gradual ramping up of client intake; continuing design and implementation of services and technologies; and monitoring and evaluation of results. Program outcomes become measurable by end of this phase.

3. **Final Program Activation -** This phase requires the finalization of program service design and technical components; extensive documentation of program outcomes; and the development of learning materials for other communities and senior governments. The completion of the Final Program Activation phase marks the end of Smart Cities Challenge contribution agreement.

4. **Program Maturity -** This phase includes ongoing client intake; program evaluation and improvement as well as the integration of new and emerging community energy technologies and solutions.

Program Deployment Phases and Households Served by Program Year

Program Year	2020-21	2021-22	2022-23	2023-24	2024-25	Total
Phase	1: Prototype Program Setup					
		2: Prototype Program Testing & Refinement				
				3: Final Program Activation		
						4.Program Maturity
Households Served	0	50	75	100	125	750 over 5 years
Relationship to Smart Cities Challenge (SCC)	Within SCC Program & Funding					After SCC

Table 4.1

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> When people are in a crisis, they need manageable steps to be able to navigate the system of services.
> – RESIDENT, TOWN OF BRIDGEWATER

Table 4.1 describes the timing of phases and the number of households served. As stated early on in the project overview, households-at-risk are less likely to also be the property owner. So the number of households served will account for both the inhabitants and the property owners of the properties they inhabit.

The extended period of prototyping, evaluation and improvement ranging from fiscal year 2021-22 to 2024-25 has been purposefully planned in recognition of the complexity of the program and the need for frequent review and adjustment of goals and solutions. This approach to prototyping is in line with smart cities approaches that revolve around continuous learning and feedback cycles using program metrics and client and partner evaluation.

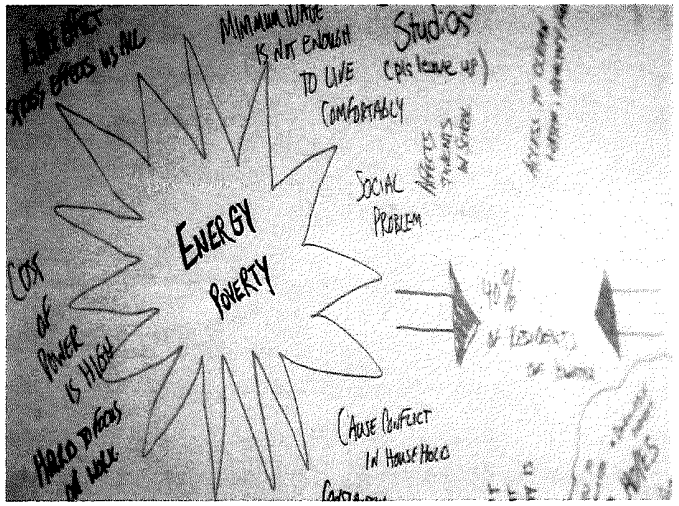
This approach has also been selected to support a robust risk management process that will ensure program risks and challenges arising from program activities, outputs, and outcomes are mitigated in real time and that emerging risks are being identified before they create problems. In particular, 4 key program risks will be continuously assessed and mitigated through this phased deployment:

- Program uptake risk: uncertainty as to the willingness of households-at-risk and property owners to participate in the program
- Financial risk: uncertainty in program costs and sources of funding and investment
- Technical risk: uncertainty in database development timeframes and functionality
- Supply chain risk: uncertainty in the availability of skilled labour to complete the envisioned infrastructure improvements

The project risks and mitigation strategies are comprehensively discussed in the next section of this chapter.

Risk Management Framework

Project risks and their respective mitigation strategies related to all other chapters in this application are fully described in this section. As described in the **Performance Measurement chapter,** the Energy Poverty Reduction Program will measure the progress toward its outputs and outcomes through an iterative process of design, prototyping, and evaluation. This approach will ensure that program risks and challenges arising from program activities, outputs, and outcomes are being mitigated in real time. It also supports the program's governance, evaluation, and quality control needs.



Notes from a discussion at a Smart Cities Challenge workshop.

Connecting these elements is the program's risk management framework, which consists of the following components:

- an analysis of program risks
- a set of overarching risk management strategies
- a series of course correction checkpoints and risk mitigation options for the program

ANALYSIS OF PROGRAM RISKS

Table 4.2 identifies significant program risks based on the theme of specific chapters within this application, as well for the overall program. Risk probability and risk impact are both measured on a relative scale of 1 (low), 2 (moderate), and 3 (high).

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Risk Assessment by Program

Risk Category	Risk	*Risk Probability	*Risk Impact	Description of Impact	Risk Summary	Monitoring & Reporting on this Risk
Overall Program	Smart Cities Challenge grant not achieved	3	3	Lack of funding for program development. Program unlikely to be implemented as proposed, and/or over much longer timeframe.	Significant risk, not easily mitigated	Proposal evaluation by Jury
	Substantial economic downturn affects overall ability to secure financing & funding	1	3	Lack of program funding. Program may need to be implemented over much longer timeframe.	Significant but unlikely risk, partially mitigatable	Investment System
	Program fails to lift residents out of energy poverty, or affect systemic change as envisioned	2	3	Affects program targets, performance measures, and ability to meet outcomes.	Significant risk, partially mitigable	Overall Program Management
	Program is too complex for clients, partners, and service providers to navigate or maintain	2	2	Affects ability of clients/partners/service providers to navigate program structures and processes. Reduces client, partner, and service provider participation rate. Delays program implementation. Adds to program cost. Affects program targets, performance measures, and ability to meet outcomes.	Moderate risk, partially mitigatable	All program services
Performance Measurement	Performance indicators cannot be measured as expected	2	1	Affects performance measurement and outcomes monitoring.	Minor and mitigatable risk	All program services
	Actual energy poverty rate is different than currently understood (38.5%)	2	2	Affects program targets, performance measures, and ability to meet outcomes. May not be able to be measured accurately.	Moderate but mitigatable risk	Overall Program Management
Governance	There is insufficient capacity/interest by program partners to maintain effective program governance & evaluation	1	2	Program implementation responsibility rests too heavily on Town of Bridgewater. Community champions lacking. Reduced program uptake. Reduced program quality.	Moderate but unlikely risk	Overall Program Management
	Client or partner makes complaint that is unable to be resolved	2	2	Additional strain on program resources & management. May escalate into legal or regulatory action against program. Affects public perception of program.	Moderate but mitigatable risk	All program services and Ombudsperson
Project Management	Contractor & supply chain capacity is lower than anticipated	3	3	Delays program implementation. May affect program quality. Likely to increase program costs.	Significant risk, not easily mitigated	Housing Energy Management System, Community Energy Systems, and Mobility Improvement System
	Key service delivery partner defaults on contract or experiences loss in capacity to carry out responsibilities	1	3	Delays program implementation. May affect program quality. May increase program costs. May lead to client/partner dissatisfaction as a result of interrupted service.	Significant but unlikely risk, partially mitigatable	All program services
	Regulatory, cost, and project management uncertainty in deployment of development and financing structures	3	2	Program design cannot be finalized until development and financing structures are confirmed. Affects cost and project management assumptions, as well as procurement and partnership design. Creates overall program uncertainty. Lack of resolution within reasonable timeframe affects program targets, performance measures, and ability to meet outcomes.	Moderate risk, partially mitigatable	Investment System and Community Energy Systems

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PROJECT MANAGEMENT

Risk Category	Risk	*Risk Probability	*Risk Impact	Description of Impact	Risk Summary	Monitoring & Reporting on this Risk
Project Management	Challenges finding or retaining qualified staff to manage the program	1	2	May delay program implementation or affect program continuity. May affect program quality. May increase program costs. May lead to client/partner dissatisfaction as a result of interrupted service.	Moderate but unlikely risk	All program services
Technology	Legislative & regulatory barriers prevent deployment of community energy solutions or delay their deployment	2	2	Delays project implementation. Affects program targets, performance measures, and ability to meet outcomes. May result in energy affordability and security goals not being met.	Moderate risk, partially mitigatable	Community Energy Systems
	Technical assessment/due diligence studies of community energy systems yield unfavorable results or take longer than anticipated	2	2	Delays project implementation. Affects program targets, performance measures, and ability to meet outcomes. May result in energy affordability security goals not being met.	Moderate but mitigatable risk	Community Energy Systems
	Development of core data platform solutions is more technically complex, costly, or time-consuming than anticipated. Scope creep.	2	3	Delays program implementation. May affect program quality. Likely to increase program costs.	Significant risk, not easily mitigated	All program services
	Anticipated data platform partners not interested in participating	2	2	Delays program implementation. May affect program quality. Likely to increase program costs. May result in interoperability challenges.	Moderate risk, partially mitigatable	All program services
	Technological disruption causes dramatic change in cost or ability to implement planned technological solutions	1	2	Effects generally unknown - may enhance or hinder program implementation, including costs and ability to meet outcomes.	Moderate but unlikely risk	All program services
Data and Privacy	A data security breach occurs in one or more data platforms	1	3	May compromise client and partner data, including personal and corporate information. May result in program shutting down operations to address security breach. May erode trust in the program and affect the program's ability to attract clients and service providers, affecting program outcomes.	Significant but unlikely risk, partially mitigatable	All program services
	Program participants' concerns about privacy are not satisfied, leading to low uptake rates/negative publicity	1	2	May affect the program's ability to attract clients and service providers, affecting program outcomes.	Moderate but mitigatable risk	All program services and Ombudsperson
	Program partners are unable or unwilling to share all or part of anticipated data	2	2	May affect program's ability to track clients, partners, and outcomes indicators. May affect program quality.	Moderate risk, not easily mitigated	All program services
	A data platform experiences a service delivery problem or unexpected failure	1	3	May result in program shutting down operations temporarily. May erode trust in the program and affect the program's ability to attract clients and service providers, affecting program outcomes. May affect program quality. May increase program costs. May lead to client/partner dissatisfaction as a result of interrupted service.	Significant but unlikely risk, partially mitigatable	All program services
Engagement	Program delays or challenges result in negative publicity in community and beyond	1	2	May affect the program's ability to attract clients and service providers, affecting program outcomes.	Moderate but mitigatable risk	All program services

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Risk Category	Risk	*Risk Probability	*Risk Impact	Description of Impact	Risk Summary	Monitoring & Reporting on this Risk
Engagement	Program is ineffective at reaching clients who are most in need	2	2	Program outcomes not achieved. Energy poverty rate not reduced as quickly as anticipated. Negative publicity may affect the program's ability to attract clients and service providers, further affecting program outcomes.	Moderate risk, partially mitigatable	Housing Energy Management System and Coordinated Access System
	Program uptake (households-at-risk) is lower than anticipated	1	2	Program outcomes not achieved. Service contract thresholds not reached. Energy poverty rate not reduced as quickly as anticipated.	Moderate but unlikely risk	Coordinated Access System
	Program uptake (property owners) is lower than anticipated	2	3	Program outcomes not achieved. Service contract thresholds not reached. Energy poverty rate not reduced as quickly as anticipated.	Significant risk, not easily mitigated	Housing Energy Management System
	Program uptake in general is higher than anticipated	2	2	Additional strain on program resources and management. Dissatisfaction in community if waiting list grows.	Moderate but mitigatable risk	Housing Energy Management System and Coordinated Access System
Financial	Legislative & regulatory requirements are not met or delayed, including expectations around regulatory changes	2	2	Delays project implementation. Affects program targets, performance measures, and ability to meet outcomes. May result in energy affordability and security goals not being met.	Moderate risk, partially mitigatable	All program services
	Major regulatory change causes disruption to program	1	2	Effects generally unknown - may enhance or hinder program implementation, including costs and ability to meet outcomes.	Moderate but unlikely risk	All program services
	Program costs are higher than anticipated. May arise from currency risk	2	3	May make housing, transportation, and community energy system improvements unattainable or only partially attainable. Increases demands on funding/financing. Delays program implementation. May affect program quality.	Significant risk, partially mitigable	All program services
	Funding from financial investors lower than anticipated	2	3	May make ROI components of program unattainable or only partially attainable. Increases demands on non-investor funding. Delays program implementation. May affect program quality.	Significant risk, not easily mitigated	Investment System
	Funding from social investors (government, foundations) lower than anticipated	2	3	May make non-ROI components of program unattainable or only partially attainable. Increases demands on debt financing. Delays program implementation. May affect program quality.	Significant risk, not easily mitigated	Investment System
	Home energy savings are lower than anticipated as result of inaccurate estimates	1	3	Affects cashflow of property owners and possibly tenants. May not achieve poverty reduction outcomes. May make poverty issues worse. Negative client experience. Affects public perception of program.	Significant but unlikely risk, partially mitigatable	Housing Energy Management System
	Home energy savings are lower than anticipated as result of insufficient funding	2	2	Affects cashflow of property owners and possibly tenants. May not achieve poverty reduction outcomes. Affects public perception of program.	Moderate risk, not easily mitigated	Housing Energy Management System
	Home energy savings are lower than anticipated as result of conventional energy prices being lower than anticipated	1	2	Affects cashflow of property owners and possibly tenants. May not achieve poverty reduction outcomes. May make poverty issues worse. Negative client experience. Affects public perception of program.	Moderate but mitigatable risk	Housing Energy Management System

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Risk Category	Risk	*Risk Probability	*Risk Impact	Description of Impact	Risk Summary	Monitoring & Reporting on this Risk
Implementation Phase Requirements	Collaboration with First Nations communities is less robust than expected	2	1	Missed opportunity for reconciliation, partnership, economic development, and cultural exchange.	Minor risk, not easily mitigated	All program services
	Diversity targets not met for recruitment, training, and procurement as per Community Employment Benefit (CEB) reporting	2	1	Inequitable distribution of community economic benefits. Missed opportunity to build program strength by learning from disaffected segments of the community.	Minor and mitigatable risk	All program services
	Legislative & regulatory requirements are not met or delayed, including expectations around regulatory changes	2	2	Delays project implementation. Affects program targets, performance measures, and ability to meet outcomes. May result in energy affordability & security goals not being met.	Moderate risk, partially mitigatable	All program services
	Major regulatory change causes disruption to program	1	2	Effects generally unknown - may enhance or hinder program implementation, including costs and ability to meet outcomes.	Moderate but unlikely risk	All program services

Table 4.2

RISK MANAGEMENT STRATEGY 1: ESTABLISH CORE RISK MANAGEMENT STRUCTURES & PROCESSES

During the first year of the program (fiscal year 2020-21) a set of 7 program structures and processes will be put in place to establish an overall risk management process.

- Governance Structure & Commitments: establish an effective program governance structure as described in the **Governance chapter.** Effective risk management across all risk areas begins with strong governance. Effective governance requires long-term commitments from key program partners as they participate in key roles on the Energy Poverty Reduction Program Steering Committee.
- **Management Structure & Capacity:** establish an effective program management team with the capacity to implement the program, as described in the **Governance chapter** and earlier in this chapter. Qualified staff working under diligent oversight by Bridgewater Town Council and the Chief Administrative Officer will ensure that a broad range of program risks are minimized by having outputs achieved effectively and on budget. Management relationships with external organizations, in particular for the Coordinated Access System and the Financial Investment Vehicle, will reduce program risk through strong service contracts and/or partnership agreements, with responsibilities, deliverables, and timelines clearly defined.
- **Evaluation Process:** Phase 1 of the program will start with the program evaluation process already active, so that the process can support the program setup work from the very beginning, allowing staff and program partners to identify, communicate, and manage any and all program risks as they emerge. Effective and timely performance tracking mitigates risk through the early identification of areas where program deliverables are falling short or experience implementation delays, allowing for course corrections. Year 1 of this process will also involve the review of program indicators so that adjustments can be made to performance measurement methodologies and targets. The evaluation process and the program outputs and

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outcomes it will measure are described in the **Performance Measurement chapter.**

- **Communications System:** ensuring timely and effective communications between program governance, program management, program partners, and program clients mitigates program risk by reducing opportunities for misunderstanding, speeding up processes, and maintaining cohesion across the multiple service areas. Detailed communications strategies will be developed for program services with high community engagement and marketing needs. Program communication will ensure cautious and transparent communication with residents on their rights related to sharing data, who will be able to see their data, and how it will be stored. Strong communication regarding the confidentiality of participants' sensitive information will be ensured to maintain trust with participants and ensure that at-risk, and vulnerable populations are insulated from potential risks for sharing sensitive information when accessing services. Program communications are the responsibility of all program managers, and are overseen by the Program Coordinator.

- **Quality Control / Quality Assurance Process:** The system to maintain the standards of the Energy Poverty Reduction Program consist of a three-level hierarchy of controls. The first level, and closest to the client, consists of an Ombudsperson and a Client Advisory Circle. These roles relate to communicating client experiences directly to the program governance and management teams, and resolving client complaints, program quality concerns, and program impact deficiencies. They are further described in the **Governance chapter.** If quality control has not been assured via the first-level supports, then issues can escalate to the Program Steering Committee where authority to make program decisions to ensure ongoing quality will be granted in the Terms of Reference. If quality control concerns exist after this second-level support, concerns can be directly expressed to the Town Council, who maintains the ultimate authority over all municipal programs.

- **System Gap Analysis Review Process:** Through the evaluation framework, emergent risks are continuously monitored across all program areas. Among these, a key risk relates to a lack of program accessibility. This is mitigated by continuously asking about whether client and stakeholder needs are being met, or whether people are 'falling through the cracks' as a result of system gaps. System gaps are also mitigated through regular contact with the Client Advisory Circle, which provides a direct channel for program clients to communicate unmet needs.

- **Privacy Review Process:** To ensure all privacy related precautions are met and data and privacy breaches are mitigated, the entire program will be evaluated from a privacy perspective through the completion of a comprehensive PIA coupled with an overarching Privacy Policy. To ensure both documents are adequate and adhere to standard privacy practices the Town will consult with privacy experts throughout the first year of the program and for all aspects of the program design.

These structures and processes will be designed, implemented and evaluated by the program management team as part of the delivery of outputs related to Overall Program Management. Major risk management checkpoints for this strategy are 6 months into year 1 (October 2020), and 11 months into year 1 (February 2021). These timeframes allow critical course corrections to be made through the risk mitigation options available at each stage (see below).

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RISK MANAGEMENT STRATEGY 2: CONFIRM FEASIBILITY OF PROGRAM

Each program service will undergo a detailed feasibility reviews 6 months before the end of Phase 1 (October 2021), and 6 months before the end of Phase 2 (October 2023), so that overall program feasibility can be assured by Phase 3 (Final Program Activation). Completing feasibility checks, and making any necessary course corrections, also helps ensure that Phase 1 and Phase 2 outputs can be achieved on time. As a risk mitigation strategy, feasibility will be assessed based on 9 areas of program performance.

These feasibility assessments will be completed by the program management team, and will allow critical course corrections to be made through the mitigation options available at each stage (see Table 4.2).

RISK MANAGEMENT STRATEGY 3: ESTABLISH CONTINUOUS MONITORING & IMPROVEMENT SYSTEM

Following the successful completion of Phases 1 and 2, risks related to program feasibility will have been assessed and mitigated, and the program will transition through Final Program Activation (Phase 3) into Program Maturity (Phase 4). This transition will require an amended risk management strategy, which is to deliver these risk management functions through a system of continuous monitoring and improvement.

Program Feasibility Assessment and Criteria

Feasibility Assessment	Feasibility Assessment Criteria
Client Participation	• Client participation rates are sufficient to meet program objectives and performance measures • The program sufficiently meets client satisfaction and needs • The program is sufficiently accessible to intended clients
Service Costs	• Current and future service costs are sufficiently known to enable service delivery planning and contracts • Service costs are within tolerable thresholds to meet program objectives and performance measures
Service Capitalization	• Current and future revenue sources are sufficiently known to enable service delivery planning and contracts • Revenue sources are within tolerable thresholds to meet program objectives and performance measures • The program sufficiently meets funder and investor satisfaction and needs
Data Availability	• Data governance processes and agreements meet partners' and clients' needs • Sufficient data is available to enable service delivery planning and contracts • Key partners and service organizations are able to share sufficient data to meet program objectives and performance measures
Data Platform Setup	• Data platforms have the minimum functionality required to achieve program objectives and performance measures • Data platforms have sufficient oversight, quality control, and security in place to meet partners' and clients' needs
Technical Solutions	• Energy management solutions are sufficiently known to enable service delivery planning and contracts • Performance of energy management solutions is sufficiently measurable to meet program objectives • Energy management solutions are sufficient to meet program objectives and performance measures • Energy management solutions sufficiently meet client satisfaction and needs
Supply Chain & Procurement	• Procurement processes for program services and products results in adequate value and contractual security to meet program objectives and performance measures • Program service providers and product suppliers have sufficient capacity to meet program objectives and performance measures over the long term • Procured services and products meet partners' and clients' needs
Regulatory Limitations	• Current and future legislation and regulations are sufficiently known to enable service delivery planning and contracts • Legislation and regulations enable program services to meet program objectives and performance measures
Program Impact	• Program outcomes and indicators are sufficiently measurable to understand program impact • Program outcomes are achieved • Program impact is defined holistically, and current and emerging gaps in program impact are reevaluated on a regular basis

Table 4.3

This system will be designed in full during Phase 3, and will likely retain a number of risk management, quality control, and performance measurement elements from Phases 1 and 2, as well as additional elements to address emerging risk issues. The continuous monitoring and improvement system will be carried out by the program management team, and will work in

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conjunction with the core risk management structures & processes defined in the first risk management strategy.

PROGRAM COURSE CORRECTION CHECKPOINTS AND RISK MITIGATION OPTIONS

The primary program course correction checkpoints discussed above allow the program management team to implement risk mitigations to improve service design and delivery should the program experience feasibility challenges or fall short on its performance expectations. Depending on the severity of risks identified through risk management and quality control activities, mitigation options may include the following:

- **Change program outputs** – revising program activities and deliverables may address a wide variety of risk, quality, and performance needs.

- **Reduce data platform functionality** – as a major source of program risk, the cost and technical complexity of the data platform may be need to scaled back in scope in order to achieve a minimum viable product (MVP) that is manageable while still achieving program outcomes.

- **Change performance indicators** – altering indicators may more effectively or more practically measure progress toward program outcomes.

- **Change partners** – program partners and service providers may be unable to achieve program deliverables, share data, or participate as meaningfully as originally intended. Finding new partners may allow the program to better meet its outcomes.

- **Increase supply chain capacity** – a major source of program risk, service provider and product supplier capacity may be insufficient to meet the significant needs of the program. Issuing stable long-term contracts, requiring capacity building activities as part of contracts, collaborating with regional trade networks and training programs, and advocating for government policies that increase trade sector capacity may all be necessary to bolster the quality and capacity of program suppliers and service providers.

- **Improve communications** – as insufficient client uptake is a major program risk, altering communication strategies may be required. Improved communications may also be necessary to attract greater interest from funders and investors.

- **Increase funding** – as a town with a very limited ability to draw additional resources from its tax base, Bridgewater lacks the means to put substantial program dollars on the table should funding levels be insufficient to meet program needs. Should program revisions described above yield insufficient risk reduction or quality improvement, or fail to build the necessary program capacity, additional funding sources may be needed to achieve program outcomes. This may result in program implementation delays.

- **Lobby for regulatory change** – municipalities are created and regulated by legislation. If any regulatory impediments or barriers are discovered, we may need to lobby to the provincial and federal governments for change, which can take time and may lead to delays in program delivery and or achievements.

- **Change outcomes** – as a last resort, program outcomes may need to be shifted to become more manageable, or abandoned altogether, if other mitigation options cannot allow the program to achieve the outcomes while also resolving program risks and quality issues.

Table 4.4 provides a preliminary assessment of the risk mitigation options that may address program risk and quality concerns at key course correction checkpoints.

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Program Feasibility Assessment and Criteria

Risk Management Strategy		Course Correction Checkpoint(s)	Risk Mitigation Options								
			change program outputs	reduce data platform functionality	change indicators	change partners	increase supply chain capacity	improve communications	increase funding	lobby for regulatory change	change outcomes
Establish Core Risk Management Structures & Processes	Governance Structure & Commitments	October 2020 and February 2021				x					
	Management Structure & Capacity		x	x					x		x
	Evaluation Process		x		x						
	Communications System		x								
	Quality Control / Quality Assurance Process		x								
	System Gap Analysis Review Process		x		x	x	x	x	x	x	x
Confirm Feasibility of Program	Client Participation	October 2021 and October 2023	x					x	x		x
	Service Costs		x	x			x		x		x
	Service Capitalization		x					x	x		x
	Data Availability				x	x				x	
	Data Platform Setup		x	x					x		x
	Technical Solutions		x								x
	Supply Chain & Procurement		x				x				x
	Regulatory Limitations		x							x	x
	Program Impact		x		x				x		x
Establish Continuous Monitoring & Improvement System		To be determined	x	x	x	x	x	x	x	x	x

Table 4.4

Project Continuation After Smart Cities Challenge

Continuation After Smart Cities Challenge Smart Cities funding will create the prototype for the Energy Poverty Reduction Program and will ultimately demonstrate the feasibility and value of this initiative continuing over the long term.

Our dedication to energy poverty reduction is evidenced in the **Performance Measurement** and **Financial chapters,** where program considerations for years 6 through 10 are described. Commitment for Town Council's ongoing role in Bridgewater's energy future was proclaimed on January 8, 2018 with the formal adoption of the 32-year Community Energy Investment Plan.

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ENERGY POVERTY REDUCTION THROUGH CONNECTED TECHNOLOGY PLATFORMS

From streamlining client intake, to enriching investment tools, to improving energy flows, connected technology plays a crucial role in all aspects of the Energy Poverty Reduction Program. A central feature of the program design is to empower households-at-risk by providing them with control over their home energy options through building upgrades that measure and monitor usage so that they can actively manage and control their energy costs.

Emerging connected technologies for household energy management built on the internet of things (IoT), big data and intelligent energy management systems are fundamentally changing the practices of households and their daily, monthly and annual energy budgets.

Evidence suggests that energy security is a significant stress factor for households-at-risk. There are cascading negative effects of missing payments on energy bills that result in financial impacts critically affecting all aspects of household life. The ability to optimize energy supply and consumption and to deliver energy reserves such as stored electrical power on demand, particularly in emergency situations, is an emerging requirement directly attributable to connected "smart" technologies and distributed energy resources.

Such technology includes smart thermostats for residential houses and smart thermal optimization for multiunit residential and municipal buildings as well as connected clean technology solutions for energy generation such as residential microgrids, virtual community loads and power plants and electricity micro market management.

At a high-level, this connected technology solution is based on three energy management "pillars" that are interoperable with one another and are all housed within an **energy resource planning platform:**

- An advanced **enterprise resource planning (ERP) system** for municipalities to ensure their housing and mobility assets are integrated with existing applications to support the households-at-risk in the community and will rely heavily on the diligent use and interoperability with the Energy Management Information System (EMIS) and Real Time Operations (RTO) system.

- an **energy management information system (EMIS)** focusing on housing energy management and community energy systems and solutions that will enable energy data monitoring and analytics. The EMIS will operationalize the efficiency of foundational and advanced applications related to energy productivity for the households-at-risk, and broader municipal energy efficiency programs. The EMIS is fully connected to the ERP system to ensure fluidity of information without compromising accuracy.

- a **real time operations (RTO) system,** enabled through supervisory control and data acquisition (SCADA) and energy management system (EMS) solutions, that will leverage the value of the program assets and coordinate its controls in real time. The RTO system is a crucial component to minimizing energy use and maximizing efficiencies, and represents the final stage of the energy resource planning platform development once the municipal ERP system and EMIS are deployed and in operation.

These pillars will enhance the experience of households, sustain optimal levels of performance and reduce the costs of household energy use. The coordinated connected technology solutions focused on the buildings where households-at-risk live will make their homes highly efficient, more comfortable, healthier places to live. In addition to direct benefits, households will be empowered by having greater control of their energy use while encouraging household interactions and knowledge sharing.

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ENTERPRISE RESOURCE PLANNING (ERP) SYSTEM

Enterprise resource planning (ERP) systems are packaged application software suites that support the common business processes, functions and data for the systems of record in an enterprise. The ERP is the system of record - the authoritative source of data that any stakeholder in an enterprise can reference to support their activities. The ERP achieves this by enabling the flow of information across the organization, in end-to-end business processes, through a comprehensive set of interconnected systems modules. Modules can be utilized in different combinations, presenting unique ERP options to meet different administrative, management, operational, analysis and reporting needs. This element of the data platform can be replicated and scaled according to local conditions.

Bridgewater's existing municipal ERP is TownSuite Municipal Software. The platform is used for finance, asset management, land management, human resources, eBilling, and customer service functions. This modified data platform would house the three pillar systems and will be operated in connection with the external Coordinated Access System data platform (HIFIS) as well as an external Financial Investment Vehicle dealing with traditional and community investors. An early conceptual diagram of the integration of the municipal ERP, EMIS, and RTO functionality is provided in Diagram 6.1.

Dialogue with Townsuite has suggested that the Energy Poverty Reduction Program can be built onto this ERP but a full assessment of functionality options, development requirements, and timelines is needed to establish an agreement.

> A one stop shop aided by technology for navigation of services would dramatically improve access to services for clients.
>
> - COMMUNITY SERVICES ORGANIZATION REPRESENTATIVE

ENERGY MANAGEMENT INFORMATION SYSTEM (EMIS)

To provide community energy management support services and achieve the outcomes of the Energy Poverty Reduction Program, it will be necessary for the Town to collect and monitor energy data, and to manage energy information on behalf of participating program clients. This functionality is achieved through the addition of the energy management information system (EMIS). The EMIS will provide relevant information to households-at-risk, property owners, and municipal departments, enabling them to improve the energy performance of their assets. The EMIS will operationalize the municipality's energy management objectives and provide an efficient means to audit and depict Energy Poverty Reduction Program outcomes.

The principal objectives of the EMIS proposed in the program is to support the municipality's energy management programs through:

- A comprehensive operations, sustainability and planning information system
- Visualizing and understanding the consumption of various types of energy through a set of energy dashboards and other analysis-based tools
- Quantifying energy use of individual home, buildings or processes
- Early detection of poorly performing buildings, systems or processes
- Reporting functions including auditing and the ability to identify performance trends

These functions, and their relationship to client homes and other community energy assets, are visualized in Diagram 6.2.

Features of the EMIS in the EPR system include a user focused web-based dashboard, the storage of data in a usable format, the calculation of effective targets for energy use, and comparison of actual consumption with these targets. Elements include sensors, energy meters, hardware and software, which may already exist as process and business performance monitoring systems.

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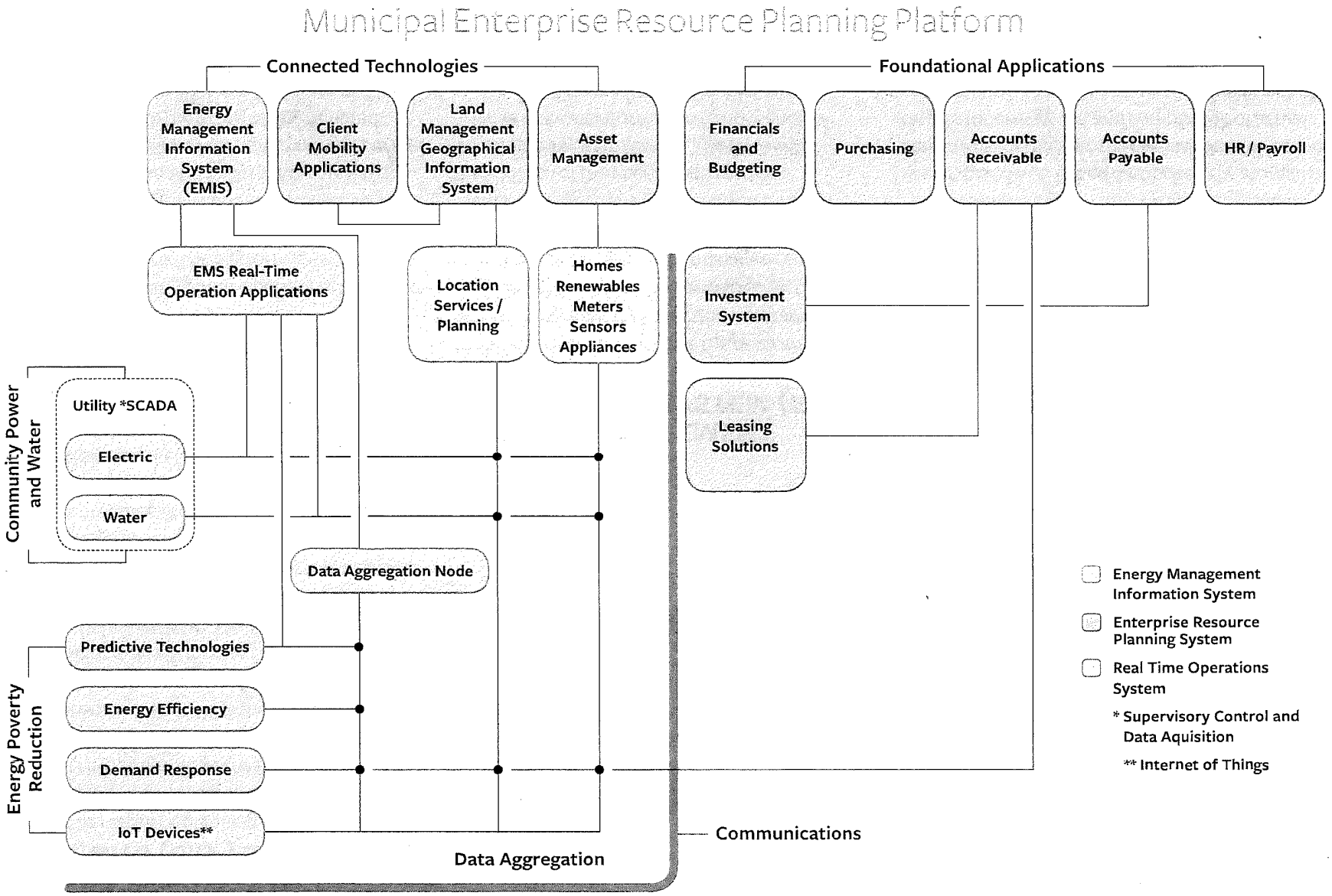


Diagram 6.1

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Energy Management Information System Overview

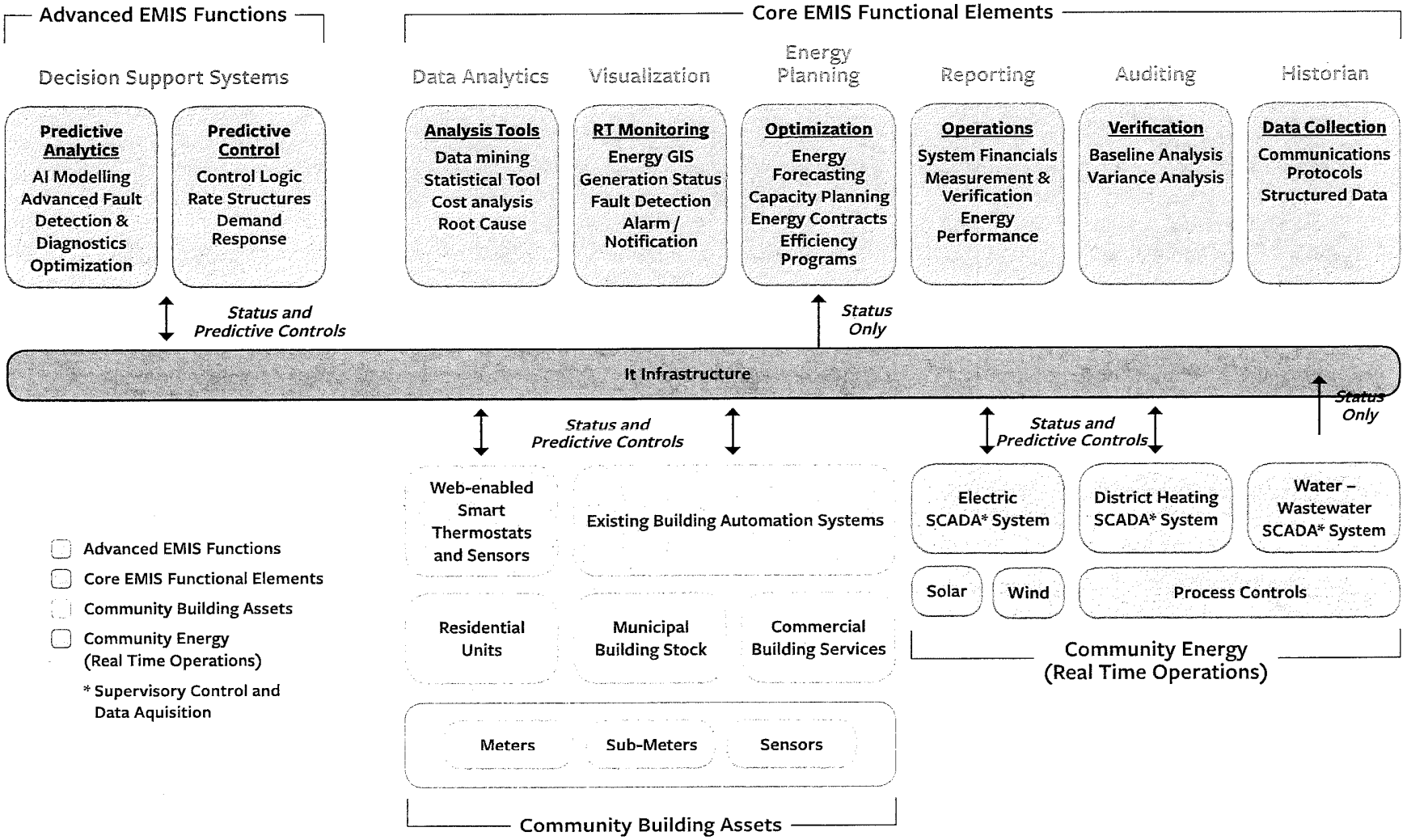


Diagram 6.2

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EMIS functionality relies on the following three components:

- **Monitoring:** the EMIS coordinates the monitored data flow from all existing real estate and energy assets. It includes energy use, generation and storage for each of the project assets in energy units - expressed in kilowatt hours (kWh) and/or gigajoules (GJ) - as well as carbon footprint - expressed in tonnes. It also includes related energy costs and the costs of energy improvements. Finally, the EMIS also includes exterior environmental conditions such as ambient weather and interior environmental conditions such as room temperature and humidity. To visualize the project outputs and results, the EMIS intends to have a comprehensive dashboard as a key program tool. It also has an advanced historian to archive compressed data without overloading the server.

- **Descriptive Analytics:** a performance and auditing tool that analyzes historical data to define the reasons for past performance successes and/or failures.

- **Predictive/Prescriptive Analytics:** an advanced analytics component that leverages real time operations (RTO) controls of energy assets and utility resources. It combines real time energy data with external data on any scale, which allows it to estimate the future energy consumption patterns of a single home, a multi-unit residential building, a neighbourhood energy system, or even the Energy Poverty Reduction Program or community as a whole. Prescriptive analytics goes beyond predicting future outcomes by suggesting beneficial energy management actions and showing the implications of each decision option.

REAL TIME OPERATIONS (RTO) SYSTEM

The real time operations (RTO) system leverages the value of the program assets and coordinates its controls in real time. The RTO system becomes active at the final stage of the program development when the core operations of its municipal enterprise resource planning system and energy management information system are deployed and in operation. The RTO system leverages the operations of the household and community energy assets in real time thus bringing additional hourly, daily, monthly and annual value to the community.

The two key parts of the RTO system are the supervisory control and data acquisition (SCADA) and the energy management system (EMS).

Supervisory Control and Data Acquisition

SCADA is a category of software application programs and hardware devices for process control. These systems gather data in real time from remote locations in order to control equipment and conditions. SCADA is used in power plants, power distribution, as well as in oil and gas refining, telecommunications, transportation, and water and waste control.

SCADA systems allow the community to:

- control distributed energy resources and industrial processes locally or at remote locations
- monitor, gather, and process real-time data
- directly interact with devices such as sensors, heating ventilation and air conditions (HVAC) equipment, photovoltaic (PV) generators, and more through human-machine interface (HMI) software
- record events into a log file

SCADA systems offer important functionality for the Energy Poverty Reduction Program's more advanced operations as they help to maintain efficiency, process data for smarter decisions, and communicate system issues to help mitigate downtime.

Energy Management System

The main goals of sustainability in the grid revolve around economic operation, reliability, and environmental impact. One of the main advantages of the energy management system

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(EMS) is that it can supply households with electricity and guarantee the reliability and intelligence of the power system.

The EMS can receive supervisory control signals based on requirements of the main grid. The system's operation policy depends on the ownership structure, connection status and market model.

The major reasons for the RTO-enabling energy management systems are as follows:

- accommodates intermittent distributed energy resources such as solar panels or energy storage in the grid
- reduces grid operation cost and emissions, thereby increasing energy efficiency
- improves grid stability, reliable fault ride-through and seamless mode transitions making the entire system more resilient

RTO - Energy Management Cycle

The RTO energy management cycle, presented in Diagram 6.3, illustrates the power of RTO functions when they work together to reduce energy poverty. This cycle forms the heart of the data and connected technology-driven energy performance improvement process, as communications between smart systems increase energy savings and energy generation. This enhances financial returns, enabling further investments in energy solutions.

CONNECTED TECHNOLOGY APPLICATIONS FOR ENERGY POVERTY REDUCTION

Connected energy technology applications are the practical on-the-ground solutions that work in unison with the data platforms described in the previous sections, and whose functions are enabled and enhanced through those platforms. These applications have a common purpose in reducing energy costs and increasing energy security for Bridgewater residents. They fall into 2 categories: connected energy efficiency solutions and connected clean energy solutions.

CONNECTED ENERGY EFFICIENCY SOLUTIONS

These are digital controls that use advanced analytics to generate energy savings:

- Smart Appliances: a smart appliance is connected to other devices or networks via wireless protocols such as Bluetooth, Wi-Fi, 3G, etc., that can operate to some extent interactively and autonomously. Smart appliances utilize modern computer and communications technology to make functions faster, cheaper and more energy-efficient.

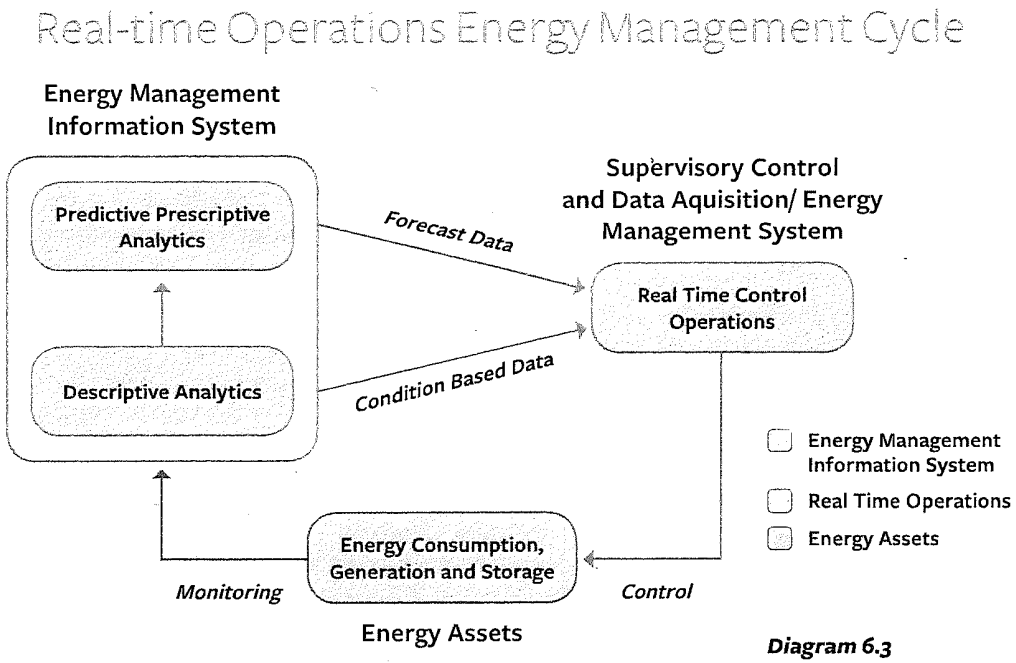


Diagram 6.3

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- **Smart Thermostats and Smart Meters for Households:** smart thermostats and smart meters form a two-stage approach to the connected technology strategy. When coupled with advanced analytics and artificial intelligence, smart thermostats can be networked or clustered together in the community to participate in a broader energy management control system.

- **Smart Thermal Optimization:** smart thermal optimization for multi-unit residential buildings (MURBs) improves the efficiency of a building's energy use by anticipating and reacting to the changing weather conditions and requirements for heating and cooling in real time. Because weather and heating/cooling loads can vary significantly throughout the day, the impact of intelligent prediction is significant. This allows for reducing building heating and cooling energy costs by on average by 10% to 25% while improving tenants' thermal comfort.

CONNECTED CLEAN ENERGY SOLUTIONS

Electricity grids are experiencing a major transformation. Connected technologies improving energy efficiency of electrical loads (such as buildings and electric vehicles) and distributed energy resources (like solar PV and energy storage) make grid operations increasingly complex. They also maximize the potential of clean, robust and flexible power grids in a low carbon future. The following connected clean energy solutions allow for the development of residential microgrids, which has a transformative impact on the power grid:

- **Residential Solar PV for Households:** residential solar PV systems can supply households-at-risk with clean, reliable and affordable electricity. When enabled with connected technology, they help coordinate the household's electricity use with the rooftop solar energy generation potential.

- **Combining Solar PV and Storage:** adding energy storage to a grid-connected PV system allows households-at-risk to store surplus solar energy for use later in the day, and provides a back-up power supply in the event of a power outage, thereby increasing energy security.

- **Predictive Energy Management (PEM) for the Community:** an emerging connected technology for reducing energy use for heating, ventilation and air conditioning (HVAC) of houses and buildings while enabling on-site solar energy generation and storage to provide auxiliary services to utilities in real time. It features coordinated supervisory predictive control of energy consumption, on-site generation, storage and ancillary services for hosting utilities. PEM promises to be a flexible distribution system infrastructure that promotes increased levels of distributed renewable energy generation and enables improved control and automation on the electricity distribution grid. The PEM solution also provides flexibility within smart grid implementation to support future innovative applications, such as energy storage, and incorporate principles of modularity, scalability and extensibility into smart grid planning.

FEASIBILITY ASSESSMENT

The feasibility of the connected technology solutions discussed above, has been confirmed by the research done in this final application development stage. Town of Bridgewater and our Townsuite Municipal Software service provider have experience and expertise with advanced ERP systems. We can confirm that key features of the software are well known, understood and tested in the municipality.

The EMIS Planning Manual and Tool[4] and the Canadian Industry Partnership for Energy Conservation (CIPEC), as well as EMIS practices and documentation have been reviewed by our technical team. The NRCan's EMIS approach is

[4] Developed and tested by Natural Resources Canada

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based on innovative energy management and strong experience in the industry and makes the proposed EMIS completely feasible for the Town of Bridgewater, and a new standard for municipalities in Canada. The key innovation in the Energy Poverty Reduction Program is related to high resolution predictive analytics and its focus on improving lives of at risk households rather than those who can afford it.

The real time operations (RTO) system for the Town of Bridgewater is based on digital SCADA coupled with energy management systems (EMS). These systems are used in many industries throughout Canada and abroad, thereby strengthening the program's ability to be replicable and scalable. Based on a review carried out by the program's technical team the proposed digital SCADA/EMS combination is highly feasible for municipal utility applications.

OPEN TECHNOLOGY PRINCIPLES AND ARCHITECTURE

One of the major inhibitors to the adoption of connected technology in smart buildings and smart cities has been the lack of interoperability between different building systems. The program's connected technology solution ensures that all connected devices are speaking the same language, allowing them to 'talk' to each other and exchange information.

Adopting open protocols for houses and buildings, such as LonWorks or ASHRAE's open-source BACnet, allows all systems to communicate in a common protocol language. These common protocol languages define the arrangements under which devices and systems interact and communicate with each other.

One key advantage of open standards architecture and open protocol systems is that they enable the integration of new devices and internet of things (IoT) sensors and systems, as long as these devices also communicate using an open protocol language. A building that adopts open architecture standards is, therefore, effectively 'future-proofed' against vendor-generated proprietary constraints through the international standard EN62402 Obsolescence Management Safeguards. Thus, new functions and devices can be easily installed when enabling technologies are developed. This is further supported by our commitment to a local workforce that will be trained to implement and operate the technologies and systems going forward.

GENERATING INTELLECTUAL PROPERTY

The program will generate intellectual property (IP) for the community and the households-at-risk related to social and technical navigation, solutions, services, and related connected technology. The program team recognises that free access to, and reuse of, these open licences is an essential part of making the program replicable to other communities and the Town is committed to sharing IP so long as privacy is not compromised.

The program will support the distribution of connected technology IP through:

- the release of IP for connected technology using open licences or other relevant instruments - while respecting intellectual property rights - so that no restrictions or charges are placed on the re-use of the information for non-commercial or commercial purposes, save for exceptional circumstances;
- the release of IP for connected technology using application programming interfaces (APIs), where appropriate, to ensure easy access to the most regularly updated and accessed connected technology; and
- encouraging innovative uses of our IP for connected technology through mentoring for its users nationally and internationally.

TECHNOLOGY IMPLEMENTATION PLAN

TECHNOLOGY IMPLEMENTATION TIMELINE

The timeline for the program's connected technology solution is described in Table 6.1.

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STANDARDS AND GUIDELINES

Enterprise resource management, EMIS, SCADA/EMS, and connected technology guidelines and standards will be communicated to, coordinated with, and confirmed by connected technology partners, vendors and energy service providers to ensure full technology interoperability where necessary.

These standards and guidelines will also be discussed with and confirmed by the connected technology partners, vendors and energy service providers to ensure and guarantee the replicability and scalability of program during the Smart Cities Challenge timeframe, toward 2030, and beyond.

The following standards and guidelines have been thoroughly reviewed for consideration:

- Canadian Standard on Enterprise Resource Planning Systems
- ISO 50001 Energy Management Systems Standard
- The International Society of Automation - Standard ISA112 SCADA Systems
- International Electrotechnical Commission - IEC 61968 Standards Based Integration for Distribution Management System
- Natural Resources Canada - Energy Savings Toolbox
- Natural Resources Canada - Energy Management Information System

ROLES AND RESPONSIBILITIES OF TECHNOLOGY PARTNERS

The program team over the finalist proposal phase has built strong relationships with a variety of connected technology solution partners and has communicated accessibility and usability of the connected technology solutions to the households-at-risk, community energy owners/operators, energy service providers, investors, and other stakeholders that support their uptake and acceptance in the program. This allows the program team to keep confident in the commitments of the partners during the program timeframe and towards the community's long-term objectives, to ensure the value to the households-at-risk and to the municipality, and to enable and train the municipal and community services' workforce. These partners are identified in the **Project Management chapter.**

Technology Implementation Plan:
Energy Poverty Reduction Project Connected Technology Solution Timeline

Relationship to Smart Cities Challenge (SCC)	**Within SCC Program & Funding**			**After SCC**
Phase	1: Prototype Program Setup	2: Prototype Program Testing & Refinement	3: Final Program Activation	4: Program Maturity
Timeframe	2020-2022 (2 years)	2021-2024 (3 years)	2024-2025 (1 year)	2025-2030 (5 years)
Municipal Enterprise Resource Planning (ERP) System	Definition and Deployment of Modifications to Existing ERP Module	Definition and Deployment of EMIS Connectivity	Full Operation	Full Operation
Energy Management Information System (EMIS)	Definition and Deployment (houses)	Development and Deployment (MURB) RTO Monitoring/ Analytics Integration	Full Operation	Full Operation
Real Time Operations (RTO) System	Municipal RTO System Design	Deployment and Testing (houses, MURB and municipal buildings) Community Energy Integration	Full Operation	Full Operation

Table 6.1

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The Town of Bridgewater proposes that the use of data and connected technology will catalyze energy related activities and outcomes. The data platforms selected will apply industry best practices to secure highly sensitive data collected from the Coordinated Access System, Municipal Enterprise Resource Planning (ERP) platform, Community Energy Systems, and Investment Systems. Further, it will defend against security breaches and protect personal information and privacy. Through continuing Energy Poverty Reduction Program efforts, Bridgewater will demonstrate to the community a commitment to responsibly managing data through its lifecycle with security and privacy considerations addressed.

ENERGY POVERTY REDUCTION DATA

DATA TYPES AND SOURCES

The Energy Poverty Reduction program expects to process data related to the following groups: household, property/asset, energy efficiency solutions and services, and investors.

TYPES AND METHODS OF DATA PROCESSING

The types and methods of data processing in the program include collection, generation, analysis, storage, and transmission of important data related to existing foundational ("legacy") technologies and connected technologies.

- **Open data:** this is all data that is (a) non-privacy-restricted and non-confidential, (b) produced with either public or private resources and (c) made available without any restrictions on its usage or distribution. The municipal methodologies to manage open data are an open data portal and an open data policy.
- **Personal information, personal health information, and non-personal information** (as defined in *FOIPOP act*): this is data that is restricted and/or licensed and requires permission to be published or distributed; it includes data held privately because its value has not yet been identified. The municipal instruments to manage private data are data security and privacy policies, procedures, legislation and regulations, as well as authentication and access controls.
- **Commercial data:** these are all types of licensed data with a financial value for use and distribution. Commercial data may be produced with either public or private resources. The municipal instrument to manage commercial data are data security and privacy policies, procedures, legislation and regulations, contracts, licenses, data transaction platforms, and data policies and principles.

The program's data platform concept also enables re-use and re-distribution of data, as well as derivative production, archiving, and preservation of data that reflects the entire data lifecycle in the Energy Poverty Reduction Program's design. This includes individual data related to households-at-risk processed in the Coordinated Access System, energy poverty reduction solutions and services data as well as energy use, generation and storage and environmental data processed in the municipal enterprise resource planning (ERP) platform, investments and other related data processed by the Investment Systems.

DATA USE

Accurate and timely data disseminated through technologies described in the **Technology chapter** is a crucial component to all 5 systems defined in the VISION chapter for the following reasons:

- **Community Energy Systems:** Energy produced by these systems credit participating household energy use.
- **Housing Energy Management Systems:** Energy use from the household level down to the appliance level define energy savings and promote it through demand-side-management and analytics.

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- **Coordinated Access Systems:** Data stored in the system streamlines Town and community service organization operations.

- **Mobility Improvement Systems:** Data shared through the above systems allow Town Planning and Operations to increase the ability of at-risk residents meet their mobility needs.

- **Investment Systems:** Energy savings and production earnings need to pass to investors in accordance to investment offerings.

DATA SECURITY

In alignment with the philosophy of "privacy by design", the program has applied focused efforts to integrate data security and privacy considerations into the project design; this was particularly important for the households-at-risk but is valued by all stakeholders.

The Town of Bridgewater and/or contracted proponents will control and own all data collected using the program's data platform including any modifications, improvements, and derivatives of such data. The data is personal and confidential and will not be disclosed or made available unless approved by the Town of Bridgewater. This data will be assessed using a Threat and Risk Assessment methodology prior to holding any live data.

IDENTIFICATION OF RISKS

Through the development of this application, we have been progressing with the identification of risks and the development of appropriate mitigating strategies for data management of the households at-risk of energy poverty. This includes completion of a preliminary Privacy Impact Assessment as part of this proposal.

ENERGY POVERTY REDUCTION DATA PLATFORM

CONCEPT

The Energy Poverty Reduction data platform will harvest the data generated by energy efficiency and clean energy solutions for households-at-risk, inform decision-making of households, the municipality and the stakeholders, and will advance and improve the performance and application of the connected technologies used. The Energy Poverty Reduction Program will also leverage its resources to build and maintain in-house analytics. The Town will develop an Energy Management Information System (EMIS) to collect, process and analyze the data provided.

STRUCTURE

The Town of Bridgewater sees the program's data platform as a leading smart city platform ensuring interoperability of/integration with existing federal, provincial and community data platforms and has identified high quality candidates for these functions.

> We understand that data and connected technologies can tremendously benefit cities or small communities enabling the discovery and more in-depth understanding of the needs of the local population
>
> - DALHOUSIE UNIVERSITY PROFESSOR

The data platform will include three major components: Coordinated Access System, Municipal Enterprise Resource Planning (ERP) platform and Investment Platforms.

The Coordinated Access system is planned to allow community organizations and service providers to collect and manage personal and personal health information on clients who are housing-insecure or homeless. This data platform will reside outside of the Town's municipal services and be used by community partners for the Coordinated Access System that would support households at risk.

The connected technology solutions enabled through the ERP platform will coordinate the households and the municipality's real estate and energy assets and energy solutions. This will be a split internally- and externally-accessed platform providing all necessary analytics and controls data for real time and planning/ reporting operations.

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There will be an internal and external investment platform orchestrated by an Investment Navigator. Community and traditional investment data will be housed in a secure database, abiding to federal and provincial rules and regulations hosted by an organization procured by the town.

FUNCTIONALITY

The data platform provide the following functions:

- **Acquisition/Interconnection:** These provide data capture mechanisms from the collection systems.
- **Data/Knowledge:** These support data processing, adding value and transforming information into knowledge.
- **Interfacing:** These enable access to information at different levels.
- **Service support:** These coordinate all the possible services involved in each action developed out of interoperability functions.
- **Security and management:** These provide horizontal functionalities such as audits, monitoring and security.

Two key interfaces allow for communication between the above group of functions:

- **Acquisition:** This interface with the program data platform enables information collection from the external elements.
- **Interoperability:** This interface with the program data platform enables communication with external data providers and the third-party computation systems.

INTEROPERABILITY WITH CONNECTED TECHNOLOGY SOLUTIONS

DATA SERVICE PLATFORMS ENABLED BY CONNECTED TECHNOLOGIES

The Energy Poverty Reduction Program data platform will have access to different information sources, share resources, analyse capacity and coordinate services, usually based on predictive analysis. The concept referred to as "horizontality" is to be applied to the program. Through "horizontality" information from various sources interact with one another in order to provide streamlined services and operations.

INTEROPERABILITY WITH DATA SERVICE PLATFORMS

Data service platforms enabled with connected technologies provide various services in specific areas. These service platforms (known as "verticals") are provided by supervisory control and data acquisition (SCADA) or more complex platforms. Most of the time these platforms are independent and do not share resources, or they do so sparingly.

The introduction of the program's data platform will enable the integration and optimization of vertical service platforms and facilitate the exchange of information and resources between these vertical service platforms. On one hand, the resources and systems used by the vertical platforms supporting the same functions can be pooled and on the other hand, the information that is stored and processed by one vertical platform can be used by the others, enabling the generation of cheaper, more valuable and more complex services.

Vertical platforms will be integrated with the program's data platform in two ways. They can be deployed inside the program or can be integrated using open interfaces, in which case the processes and resources required by the vertical platform could not be deployed inside the Energy Poverty Reduction program.

Open interfaces are required to interconnect the program's data platform with other municipal platforms enabling other systems to interoperate with the program more efficiently. In the integration process some resources, such as data source, can be shared. Since the services can access more data sources, it is possible to create new services and improve those that already exist. Predictive analysis is also facilitated, because more data sources are accessible.

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The program's data platform could interoperate with external providers' platforms, and its interfaces are required to be adapted. The adaptation of these interfaces will depend on the type of platform.

DATA PLATFORM SECURITY

The Town of Bridgewater will control and own all data collected by the Energy Poverty Reduction Program data platform including any modifications, improvements, and derivatives of such data. The data is personal and confidential, and thus will not be disclosed or made available unless approved by the Town of Bridgewater. At all times the program's data platform and related technologies must be compliant with all applicable privacy legislation provincially. Cyber management is examined in further detail in the preliminary Privacy Impact Assessment (PIA).

NETWORK SECURITY

The network provider will take a number of steps to ensure the security of their networks. A dedicated team of security professionals will focus on network security and security governance. This will include, but is not limited to, multiple levels of security such as service security authentication mechanisms, secure access to client locations/sites, change control validations/ processes/policies and network monitoring tools/ applications/audits. This will be confirmed through the completion of a Threat and Risk Assessment. The Office of the Information and Privacy Commissioner for Nova Scotia (OIPCNS) has outlined the importance of designating a Chief Security Officer who is responsible for security: IT system maintenance and security, security awareness, ensuring digital and physical security, etc. for both the program and municipality. The Town will act on this recommendation as part of the detailed program design.

RESILIENCY

The Energy Poverty Reduction data platform will ensure the ongoing operation of services according to established service level agreements. These services may require availability 24x7 and a service level of over 99.9% annually. Providers may offer solutions complying with these requirements.

CYBER THREATS MANAGEMENT

Cyber threats to the program's data platform will be addressed through cybersecurity scanning and tests in the Platform, for threats such as malware, phishing, spear phishing, lost or stolen devices, distributed denial of service.

OPEN DATA AND BIG DATA STRATEGIES

THE OPEN COMMUNITY

The municipality's need for transparency and accountability has always been seen as fundamental by the Town of Bridgewater. The community is very supportive of the Open Government Partnership (OGP) created in 2011 and having Canada among its 75-member countries.

OPEN DATA FOR THE ENERGY POVERTY REDUCTION PROGRAM

The Town will make certain data types open to public stakeholders through online portals. This will come at no cost to the user and a standard license to allow re-use and distribution may apply.

Municipal data, like any data collected by public institutions, are subject to privacy legislation for personal information and other restrictions which limit it being made public (e.g. intellectual property).

The program defines the data spectrum including closed data (internal access), shared data (with group-based access) and open data (with public access and open to everyone).

The program data management addresses important Open Data strategy development related to high resolution environmental data and data analytics, public housing and mobility data and data analytics as well as public data on energy efficiency and clean energy solutions and services for the Bridgewater community.

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COMMITTING TO G8 OPEN DATA CHARTER: BEST PRACTICES

The EPR project is committed to all 5 Open Data Charter[5] best practice principles, in accordance with Federal and Provincial legislation and regulations.

BIG DATA STRATEGIES

Big data that is collected through the Energy Poverty Reduction Program will allow municipal policies makers to make decisions based on real information, enabling them to further improve energy performance, related energy use, mobility and transportation decisions, etc.

PERSONAL DATA AND INFORMATION PRIVACY

PERSONAL INFORMATION FOR ENERGY POVERTY REDUCTION

The Smart Cities Challenge approach uses real-time and actionable data to inform the operation of community-wide systems and services. The Energy Poverty Reduction Program demonstrates the inclusion of measures to protect personal information and privacy and respects the fair information principles.

Personal information is data about an "identifiable individual." It is information that, on its own or combined with other pieces of data, can be used to identify a specific individual. In some circumstances, information that may appear to be non-identifiable may still qualify as personal information if there is a risk of re-identification. See Preliminary PIA for *FOIPOP act* considerations.

Health information in the Energy Poverty Reduction Program can include, items as defined by Nova Scotia's PHIA act. See Preliminary PIA for PHIA act considerations.

The program's information will be combined and analyzed with data from different sources and could become identifiable personal information. To mitigate this risk, the program team will seek to de-identify personal information at the earliest opportunity, and always pursue the least privacy-invasive options wherever possible. See the Preliminary PIA for further details surrounding data consent, data sharing opt-out options, server locations, data ownership and governance, safeguards and transparency.

HOMELESS INDIVIDUALS AND FAMILIES INFORMATION SYSTEM (HIFIS)

The Homeless Individuals and Families Information System (HIFIS) software is owned by Service Canada which it shares nationally with communities to assist services delivery agencies track and report on their efforts, ultimately supporting vulnerable households; those who are homeless or at risk of being homeless. The HIFIS system is undergoing upgrades to a cloud-based system allowing for fluid information sharing between services organizations. Individuals seeking homeless related services, through local service providers, no longer have to repeat their stories multiple-times to each party, as their HIFIS profile is now shared amongst services organizations granted the client provides consent. Two service organizations within the Town currently use HIFIS (Freeman House and Second Story Women's Centre), and it's expected this number will grow as the newest iteration rolls out.

Through attending a HIFIS training session, correspondence with community service organizations, dialogue with the Affordable Housing Association of Nova Scotia (AHANS), and examining research that suggests energy poverty contributes to housing insecurity, the Town has identified HIFIS as being a key component to the Energy Poverty Reduction program. One has the ability within HIFIS to create unique fields and surveys, for specific programs, which can be partitioned off from other community service programs and organizations at the household's request. The Town will create its own survey and fields for the purposes of tracking program outcome indicators.

[5] G8 Open Data Charter: Technical Annex https://opendatacharter.net/g8-open-data-charter/

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Energy meters on the side of an apartment building.

This data platform would reside outside of the Town's municipal services and an agreement would need to be established between the municipality (or to be determined service organization) and AHANS, who has a contract with Service Canada, or Service Canada itself. This would allow our household indicators to be stored on AHANS's HIFISNS Network host (Canada Web Hosting) which meets Federal Government security standards.

The Office of the Information and Privacy Commissioner for Nova Scotia (OIPCNS) has outlined their concerns related to HIFIS . These concerns include creating a more robust view of a household through information gathered by the program and potentially Federal government access to this information. The Town will address these concerns through a Privacy Impact Assessment (PIA) as outlined in the Preliminary PIA.

PRELIMINARY PRIVACY IMPACT ASSESSMENT

To support the selection and design of a comprehensive data management system, the Town of Bridgewater developed a preliminary privacy impact assessment (PIA) for the Energy Poverty Reduction Program. The PIA includes a map depicting all of the program's anticipated data flows for the key project activities: Intake, Service Delivery, and Monitoring and Analytics and qualified their associated security and privacy risks. While developing the preliminary PIA the Town of Bridgewater staff actively consulted with the Office of the Information and Privacy Commissioner (OIPC) of Nova Scotia to ensure that the program design conforms with all applicable privacy laws and best practices. Project staff also worked with the Town's Finance Department and the Municipal Joint Services Board (MJSB – IT Services) to ensure that project IT needs can be met and are compatible with existing services and infrastructures.

Through the PIA, the Town of Bridgewater demonstrates that relevant privacy authorities were consulted, and their guidance was considered during the program and application development. The PIA reviews and supports the Energy Poverty Reduction Program's compliance with relevant municipal, provincial/territorial, and federal privacy regimes.

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ENGAGEMENT ACTIVITIES UNDERTAKEN TO DATE

INITIAL APPLICATION PHASE: JANUARY – APRIL 2018

We looked to the public to teach us about energy poverty, their experiences, core concerns, and suggestions on how a Town strategy could reduce energy poverty. Feedback from over 200 residents reinforced public support for reducing energy poverty. The submission of the Town's initial application to Smart Cities Challenge, and its eventual selection as a Finalist, was met by enthusiastic support from the community and our stakeholders, a support that has continued to grow continuously over the course of the Final Application development phase.

FINAL APPLICATION PHASE: JUNE 2018 – MARCH 2019

We produced a comprehensive Community Engagement Plan that identified the project's primary stakeholders and identified the outcomes of the program that were relevant for each group. For each group, it planned a schedule of engagement activities, complete with desired engagement outcomes. The Community Engagement Plan was implemented through the following activities:

1. Energy Poverty Research Program

This program sought to document and better understand the lived experience of energy poverty. It included the following:

Interviews: 20 interviews were conducted, consisting of 12 women and 8 men with a broad age distribution of 18 – 65 and over; 75% of interviewees were renters, 10% lived in affordable housing, and 15% owned their home; and 12 participants received income assistance and 8 did not.

Focus Groups: 57 individuals participated in the focus groups, consisting of 38 females, 16 males, and 2 transgendered females; 45 renters and 11 owners; and 50% of participants were on income assistance.

Key Findings:

- Many individuals living in energy poverty have developed energy management strategies for dealing with their energy burden;
- Several demographics are more at-risk for energy poverty including: single mothers, African Nova Scotians, seniors, and those with health conditions and disabilities;
- Energy poverty has a severe impact on a household's ability to spend on other essential goods and services, forcing trade-off decisions on food, health, and entertainment;
- Residents are highly supportive of long-term community-based solutions which provide greater access to quality housing, affordable energy, and greater mobility options.

The research program provided the opportunity to build early relationships with our eventual clients and include our learning into the program design. To promote involvement, the Town offered an honorarium of $20/hour for program participants.

2. Engagement of Community Stakeholders

Workshops. A series of 8 workshops involved open discussion on almost every component of our application. Over 30 organizations have been represented at workshops, with over 140 representatives in attendance. Some of the key learning outcomes that were achieved through the workshops include:

- Service organizations with a diverse range of mandates identified energy poverty as one of their clients' key challenges and a core service priority;
- Service organizations endorsed addressing the systematic causes of energy poverty;
- Data and connected technology solutions were identified as essential to increasing collaboration and efficiency of resource allocation for service organizations.

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Interviews: We undertook 15 one-hour interviews with representatives of partner organizations. From these interviews we learned that:

- Partners have insufficient resources to address the basic energy, housing, and transportation needs of their clients;
- Partners are supportive of a coordinated access system for their clients;
- Spending on energy related services constitutes a large portion of many organization's budgets;
- To reduce costs, there needs to be a shift from spending on emergency services to preventative services.

3. Engagement of the Public at Large

The Town involved a substantial number of individuals by utilizing a range of in-person and online engagement activities.

Youth Video Documentary: The Town worked with the HeartWood Center for Community Youth Development, the Department of Community Services, and Picnic Studios to bring together a video team comprised of 5 youth-at-risk from Bridgewater and area. The youth team created a video documentary called *Living in Energy Poverty* which was premiered at an Open House on January 17, 2019. Parts of the footage was incorporated into the Town's 5-minute Smart Cities Challenge video pitch. The documentary has received regional recognition for how it captured the lived experience of energy poverty and was featured in a CBC Nova Scotia article about energy poverty in Bridgewater.

Community-Wide Paper Survey: A paper survey yielded a total of 585 responses, representing 15% of Bridgewater households. Important program information received through the survey included:

- 38.5% of respondents said that they had difficulty affording energy costs and spent more than 10% of their after-tax income on energy and transportation costs. This indicator will act as a baseline to track our energy poverty rate as part of program performance and measurement.
- Responses were tracked by housing type and neighbourhood, which informed the mix of housing ages, forms, and heating systems used to inform this proposal's financial outcomes and energy analysis.

Thematic Surveys: We received a total of 278 responses from 4 different thematic surveys, covering housing; transportation; health; finances; and employment and training. Some of the key findings from the surveys include:

- 74% of respondents stated that they had faced difficulty paying rent, energy bills, or transportation in the last five years;
- Middle income households can also suffer from energy poverty.

Social Media: Town staff routinely engage residents using social media to answer questions, and provide further information related to the Energize Bridgewater and Smart Cities Challenge programs.

Video and Image Media: 10 videos were produced to document the Town's workshops with partners, engagement with residents, and illustrated the Town's application. This content was shared over the Energize Bridgewater and Town of Bridgewater social media pages. An interpretive exhibit was created that featured quotes shared by participants from interviews and focus groups. The exhibit has been displayed in four locations across town to initiate further engagement with the community on energy poverty.

Open Houses: On January 17, an open house was held for the public at large that premiered the youth video documentary described above. On March 29, a final open house will explain the community's final application to the public.

ENGAGEMENT PRINCIPLES GOING FORWARD

The design of the community engagement approach for the Energy Poverty Reduction Program is founded on 5 principles:

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ATIA - 21(1)(b)

1. **Consideration of full-spectrum needs:** engagement efforts will be designed based on an integrated understanding of the needs and aspirations of program clients and partners. This ensures that their voice matters, and that emerging risks and challenges are addressed in a timely fashion. Design and evaluation of engagement efforts will consistently refer to the broad set of desired program outcomes.

2. **Inclusion and accessibility:** these principles will continue to inform the design of the program. Ongoing efforts to understand the needs of clients, use a trauma-informed lens for service design and delivery, evaluate which voices are not being heard, and challenge assumptions and stereotypes, will help meet inclusion goals. The accessibility of the program will also constitute an important evaluation criterion for program partners, in particular the Coordinated Access System and the Housing Energy Improvement System.

3. **Empowerment:** the central purpose of the program is to enhance energy management capability for program clients and throughout the community. This principle extends toward ensuring that program clients have a say in program design, delivery, and evaluation. It is operationalized through engagement structures such as the Client Advisory Circle and the role of the Ombudsperson, continuous feedback from clients and partners, and the use of connected technologies to better access information and communicate needs. For program partners, it means participation in the program governance structure, and through ongoing feedback and evaluation processes.

4. **Consent:** obtaining informed consent to receive program services and to share data is critical for fostering trust and encouraging participation. The Town and its service delivery partners must ensure that clients are appropriately informed about the services that they will be receiving, as well as their rights and responsibilities as clients.

5. **Navigation support:** the provision of extensive navigation services is necessary to help clients overcome difficulty in navigating community and government support systems and bureaucracies. The Household Navigator, working through the Coordinated Access System embodies this principle for households-at-risk, as do the Technical Navigator and Investment Navigator roles for property owners and investors, respectively.

PROGRAM CLIENTS, STAKEHOLDERS, AND ENGAGEMENT TOOLS

Energy Poverty Reduction Program stakeholders are described below, along with engagement objectives and tools that have been tailored to their needs:

Households at Risk of Energy Poverty

Currently estimated at 38.5% of Bridgewater's population, these residents are a primary client of the program. Engagement objectives and tools:

1. ***Ensure that clients' voices and needs are heard as part of the program design and evaluation.*** Engagement activities include representation on the Client Advisory Circle, active participation in program design through focus groups, interviews, surveys, and service testing, and through feedback from program partners who serve these clients.

2. ***Connect clients to the community and energy services they require.*** Engagement activities will be driven by the Coordinated Access System and its Household Navigators. It will provide high quality, accessible services that are designed specifically with an eye to serving the broad range of needs and levels of urgency experienced by households-at-risk. In delivering coordinated access services,

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clients will be educated on their options, rights and responsibilities in sharing their personal data. A Communications Strategy will be developed to attract clients.

3. ***Empower clients to better manage their energy systems.*** Engagement activities will include the provision of energy management services for clients who are also homeowners, and referral of landlords to these services if the clients are renters. A home energy 'dashboard' will be provided to clients, with an ever-growing set of energy management solutions as those become available from the evolving Energy Management Information System and community energy systems. Clients receive energy management training to build their skills and knowledge, and to share with other clients those energy management practices that they have already developed and refined.

Property Owners

Bridgewater property owners whose properties are inhabited by households-at-risk of energy poverty are a primary client of the program. Engagement objectives and tools:

1. ***Ensure that clients' voices and needs are heard as part of the program design and evaluation.*** Engagement activities are the same as for households-at-risk.

2. ***Connect clients to the technical solutions they require.*** Engagement activities will be driven by the Housing Energy Management System and its Technical Navigators. High quality, accessible services will be provided, with attention to the needs of landlords to help them overcome split incentive issues that often complicate energy improvement efforts. Clients will be educated on their options, rights and responsibilities in sharing their personal and property data. A Communications Strategy will be developed to attract program clients.

3. ***Empower clients to better manage their energy systems.*** Engagement activities are the same as for households-at-risk.

Investors

Program capitalization will be achieved by attracting and retaining investments from specialized funders, as well as traditional and community investors. Engagement objectives and tools:

1. ***Ensure that investors' voices and needs are heard as part of the program design and evaluation.*** Engagement activities will centre around direct outreach during the program design and prototyping phases to ensure that program outputs, outcomes, and financial returns represent adequate value for investment.

2. ***Achieve investments for the program.*** Engagement activities will centre around continuous outreach, marketing, and reporting to investors. Investors will learn about investment opportunities and their benefits, including the ability to leverage further funding, and to reduce long-term costs to these agencies through efficiency gains that come from coordinated housing improvements and community services provision. Traditional and community investors require detailed financing prospectus documents to attract their investment interest. Maintaining investor relationships is a key activity for the Investment Navigator and the Financial Investment Vehicle.

Service Delivery Partners

Program governance and service delivery will involve multiple levels of relationships with project partners and service providers. Engagement objectives and tools:

1. ***Develop a strong and committed partner network.*** Engagement activities will involve building on existing relationships with essential program partners such as Efficiency Nova Scotia,

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TownSuite Municipal Software, the South Shore Housing Action Coalition, Family Services of Western Nova Scotia, and others. Stakeholders will continue to advise on goals, metrics, data needs and benefits, use cases for data, budget, policy, operations, end-user needs, and program governance. Partners will be invited to apply to the Energy Poverty Reduction Program Steering Committee and Technical Advisory Committee to support the program's governance and advisory functions as described in the **Governance chapter.** Broad participation from community partners will be required to design the Coordinated Access System and to provide access points throughout the community. Led by the Program Coordinator, ongoing evaluation processes with partners will ensure continued engagement.

2. ***Maintain program quality and manage risks.*** Once program services have started, engagement activities will revolve around quality control and evaluation. All service delivery partners will be involved in the processes described in the **Project Management chapter.** This will extend to engagement with regional trade networks and supply chain capacity building.

Acadia First Nation

The Town of Bridgewater is in Kespukwitk (Land Ends) on the unceded territory of the Mi'kmaw. Acadia First Nation (AFN) is the Mi'kmaw Nation within whose territory Bridgewater is located. Guided by the Community Engagement Plan, Bridgewater Town Council issued a formal expression of interest in 2018 to initiate government-to-government relations with AFN. The Town will **continue to develop this relationship.** Engagement activities will focus on cultural exchange, knowledge transfer, and the identification of partnership opportunities for energy-related initiatives that achieve mutually beneficial outcomes.

Senior Government and Other Communities

The Province of Nova scotia and the Government of Canada have jurisdiction over legislation, regulations, policies, and programs that influence energy poverty risk factors for Bridgewater residents as well as for other communities. Engagement objectives and tools:

1. ***Inspire positive change across the Province and the country.*** Engagement activities will be centred on knowledge transfer and advocacy, so that energy poverty solutions developed in Bridgewater can achieve broader systems-level impact. Participation in the Smart Cities Challenges offers a powerful platform to do so.
2. ***Inspire energy poverty reduction actions in other communities.*** Engagement activities will be centred on knowledge transfer. The Town will also use its regional networks and its membership in the Federation of Canadian Municipalities to achieve these ends.

General public

The community of Bridgewater at large, plus surrounding communities, will have ongoing interest in the program, and receive direct and indirect benefits from it. Engagement objectives:

1. Openly communicate program outcomes and benefits to the community.
2. Receive feedback on broader program benefits and outcomes.

MONITORING AND EVALUATION

The evaluation processes described in the **Performance Measurement chapter,** and the quality control and risk management processes described in the **Project Management chapter** will ensure that that outputs and outcomes associated with stakeholder engagement are monitored and evaluated on an ongoing basis. Program risks associated with engagement efforts are identified in the **Project Management chapter.**

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MODERN TREATY OBLIGATIONS AND DUTY TO CONSULT WITH INDIGENOUS GROUPS

The Town of Bridgewater received confirmation through the Nova Scotia Office of Aboriginal Affairs that The Town is not required to consult with the First Nations in this province at the application stage of this project. The Town has consulted with Acadia First Nations based on Duty to Consult principles and as a good governance practice in accordance with the *Government of Nova Scotia Policy and Guidelines: Consultation with the Mi'kmaq of Nova Scotia.* The Town intends to undertake further consultation and build a partnership with Acadia First Nations regardless of the outcome of the application.

COMMUNITY EMPLOYMENT BENEFIT

The Town will be participating in the Community Employment Benefit Initiative. In order to do so, the Town will create a Community Employment Benefit policy to guide training, hiring, and procurement processes. The policy will result in a revision to our existing HR and Procurement Policies which do not yet include the principles of the Community Employment Benefit Initiative.

The Town will identify employment and procurement opportunities for three groups targeted by the initiative soon after the funding decision is made. Through feedback we received in consultation of residents and partner organizations, the Town is already aware of several groups who could be identified for employment and procurement opportunities.

No one individual can be held accountable, but we can hold a community accountable.
– RESIDENT, TOWN OF BRIDGEWATER

The Town will adhere to the following plan in the selection of the employment and procurement opportunities:

1. The Town will consult with community partners to come to a consensus on the needs of employment and procurement opportunities for the inclusion of those who are traditionally underrepresented.
2. A needs assessment will be undertaken to identify employment opportunities.
3. The town will develop partnerships for resident recruitment through partner organizations.
4. Measurable indicators will be created to monitor progress.
5. Dispute resolution mechanisms will be drafted.
6. A reporting framework will be created.

CLIMATE LENS ASSESSMENT

The Town of Bridgewater is not required to undertake a Climate Lens Assessment for the purposes of this application because we are in the $5 million prize category. Even so, a key focus of the Town's application is on a reduction in GHG emissions. The Town quantified and set targets for GHG emissions reductions of 80% by 2050 in our 2018 Community Energy Investment Plan (CEIP). The Plan provides guidance for many climate mitigating project outcomes and details their climate impacts. The Town was one of only two communities in Atlantic Canada who submitted to the Carbon Disclosure Project (CDP) in 2018 and received an overall score of B, higher than the regional and global averages.



Community stakeholders watching a presentation at a Smart Cities Challenge workshop.

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The project will draw on a wide array of partners and stakeholders who are working at the ground level on poverty reduction, transportation, and employment to identify opportunities for shared solutions.

– COMMUNITY SERVICES ORGANIZATION REPRESENTATIVE

OTHER APPLICABLE LAWS, REGULATIONS AND POLICIES

FEDERAL POLICY

- **Reaching Home: Canada's Homelessness Strategy** Bridgewater's proposed outcomes for the provision of affordable, secure housing is closely aligned with *Canada's Homelessness Strategy*. The Town will utilize Employment and Social Development Canada's Homeless Individuals and Families Information System (HIFIS) software as the data platform for our Coordinated Access system.

- **A Place to Call Home: Canada's National Housing Strategy (2018)** Our project aligns with the Government of Canada's National Housing Strategy with activities aimed at providing preventative actions for reducing homelessness, helping households to find suitable housing and ensuring housing remains affordable.

- **Opportunity for All: Canada's First Poverty Reduction Strategy (2017)** Our project aligns with the Government of Canada's commitment to reducing poverty by 50% by 2030. In many ways, the Town's Energy Poverty Reduction Program mirrors the approach being taken nationally but with a more specific focus on the energy element of poverty and a course of action that is meaningful, measurable and monitored.

PROVINCIAL LEGISLATION AND POLICY

- **Municipal Government Act** As a municipal unit will operate in accordance with legislation laid out in the Nova Scotia Municipal Government Act and related regulations.

- **Housing Act** The Town of Bridgewater will develop policies in accordance with the legislation.

- **Building Code Act** The Housing Energy Management System within the Energy Poverty Reduction Program will adhere, at minimum, to the requirements set out in the Act and related regulations.

- **Access by Design 2030 Achieving an Accessible Nova Scotia:** The Town is aligned with the Act's acknowledgement that accessibility is a human right and through our Mobility Improvement System.

- **The 2005 Environmental Goals and Sustainable Prosperity Act (EGSPA)** Our proposal aligns with goals on sustainable prosperity, such as emission reduction, energy efficiency programs, climate change adaptation and improving the Province's environment and economy for future generations.

- **Nova Scotia's Electricity Plan 2015-2040** Our conforms with key themes of Nova Scotia's Electricity Plan to ensure stable electricity prices for residents, create innovative energy systems that promote customer control, integrate systems, and increase the value of renewable energy resources in home heating and transportation.

- **A Housing Strategy for Nova Scotia (2013)** Our aligns with and supports the Province of Nova Scotia's goal to ensure that Nova Scotians can find the housing choice that's right for them and their families, at a price they can afford, in a healthy, vibrant community that offers the services, supports and opportunities they need.

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INTRODUCTION

For Bridgewater to lift 20% of its residents out of energy poverty in 10 years, $89.8 million dollars needs to be invested into the community. The $5 million prize of the Smart Cities Challenge is just a fraction of the overall cost but is the catalyst that will enable the Town to make this bold step forward to ensure no family is left behind. It is also an investment in the shift required to achieve a clean, efficient, affordable and secure energy future for our community.

By the end of the Smart Cities Challenge program in 2025, our community will have been the recipient of $45.7 million worth of investments in housing, transportation, community energy systems, and community services. As Table 9.1 indicates, that will increase by another $44.1 million over the next 5 years as the program matures through years 6-10. The large majority of these investments relate to 'hard' costs and come with financial returns (labeled "with ROI" in the tables and charts in this chapter). By undertaking strategic de-risking activities, and leveraging the power of connected technologies such as home energy monitoring systems, Bridgewater will be able to bundle these investment opportunities and make them attractive to a diverse group of investors. Pooled capital implements the energy poverty reduction solutions described in the previous chapters, which systematically lifts Bridgewater residents out of energy poverty. These capitalization activities are explained in detail later in this chapter.

To deliver on these opportunities, the Energy Poverty Reduction Program will incur $5.42 million in core operating costs over the first 5 years. These costs consist of program development, operations, and administration. They can be offset by the $5 million Smart Cities Challenge grant, which acts as a catalyst that allows the community to leverage the additional $40.3 million over that same timeframe, an investment leverage ratio of 1:8 for the grant. The remaining core operating cost can be achieved with an in-kind contribution of $420,000 from the Town of Bridgewater. As indicated in Table 9.2, 2.6% of the Smart Cities Challenge grant would be held in reserve as a contingency. If unused, this amount can help subsidize home energy improvements for program participants.

> Through our proposed solutions, we will make sure those among us who are most vulnerable and least able to afford the transition, are the first ones we help across the threshold. Those residents have the most to lose and through the betterment of their lives, our community has everything to gain. - MAYOR MITCHELL

Energy Poverty Reduction Program Total Costs by Activity for Each Program Year

Program	Activity	2020-21	2021-22	2022-23	2023-24	2024-25	Years 1-5 Total	Years 6-10 Total	Grand Total
Sub-Totals	Program Development	$1,295,000	$700,350	$128,778	$130,710		$2,254,838		$2,254,838
	Program Operations & Administration	$207,500	$624,225	$691,539	$750,274	$890,219	$3,163,756	$4,385,043	$7,548,799
	Capital Planning & Improvements- No ROI		$1,185,013	$1,452,617	$1,905,749	$2,366,841	$6,910,219	$14,693,023	$21,603,242
	Capital Planning & Improvements- With ROI		$1,731,945	$9,199,368	$11,015,163	$11,442,793	$33,389,270	$25,012,945	$58,402,215
	Total	$1,502,500	$4,241,533	$11,472,302	$13,801,896	$14,699,852	$45,718,084	$44,091,010	$89,809,094

Table 9.1

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APPENDIX: LETTERS OF SUPPORT

The Town of Bridgewater received letters of support from the following people and organizations for our Smart Cities Challenge Finalist application:

1. Affordable Energy Coalition
2. Affordable Housing Association of Nova Scotia
3. Be the Peace Institute
4. Big Brothers, Big Sisters of South Shore
5. Bridgewater Active Transportation Advisory Committee
6. Bridgewater and Area Lions Club
7. Clean Foundation
8. Dalhousie University - Faculty of Computer Science
9. Ecology Action Centre
10. Efficiency Nova Scotia/ EfficiencyOne
11. Energy Services Association of Canada
12. Family Services of Western Nova Scotia
13. Green Power Labs
14. Housing Nova Scotia
15. Lunenburg County Seniors Safety Program
16. Lunenburg County YMCA
17. Halifax Regional Municipality
18. New Dawn Enterprises Limited
19. Nova Scotia Community Transportation Network
20. Nova Scotia Department of Energy and Mines
21. Nova Scotia Health Authority
22. Nova Scotia Power
23. Nova Scotia Works
24. Nova Scotia Community College – Lunenburg Campus
25. Quality Urban Energy Systems of Tomorrow
26. RNDT Development
27. SchoolsPlus
28. Second Story Women's Centre
29. Small World Learning Centre
30. Society St. Vincent de Paul
31. Souls Harbour Bridgewater
32. South Shore Family Resource Association
33. South Shore Housing Action Coalition
34. St. Mary's University - Department of Mathematics and Computing Science
35. The Ark and Support Services Group
36. The Honourable Mark Furey, MLA Lunenburg West
37. The Honourable Steven McNeil, Premier of Nova Scotia
38. The Salvation Army, Bridgewater Corps
39. TownSuite Municipal Software
40. United Way Lunenburg County

These letters are appended in alphabetical order as presented above.

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CONNECTYXE

SmartCitiesChallenge



City of Saskatoon

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City of Saskatoon

OUR MISSION:

To be the city that breaks the cycle of Indigenous youth incarceration by creating a new cycle focused on building purpose, belonging, security and identity.

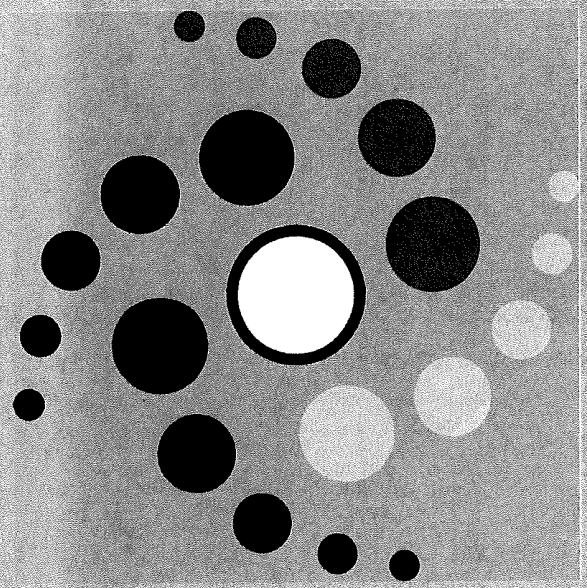


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00 Executive Summary

Our Challenge Statement is to be the city that breaks the cycle of Indigenous youth incarceration by creating a new cycle focused on building purpose, belonging, security and identity.

We worked closely with an Indigenous Youth Advisory Group and with community allies and institutional partners who provide programs and services to Indigenous youth. Understanding and incorporating the experiences and ideas of Indigenous youth is at the centre of this challenge.

The insight that emerged was that the cycle of incarceration begins with a series of harmful decisions. These decisions were often the result of preventative programs and services being too difficult, or unknown to the youth, for them to access in the moment they needed it. By contrast, a series of well-made decisions can give youth a plan and a path to a healthy cycle.

A smart city enables its citizens to use technology to make smart decisions.

The ConnectYXE program described in this proposal uses technology to connect people with programs and services, and to make decisions that will improve their lives. It is a program that supports empowerment, strengthens collaboration and harnesses innovative technology.

Empowerment of Indigenous youth and their families: providing real time information and options for how to access services throughout the city, every day, all day. For example, when a youth finishes school for the day, ConnectYXE will give that youth the information to plan out their afternoon and evening: play pick-up basketball in a community gym, have a meal, find a place to sleep, connect with an Elder, and find the public transportation options to reach their destinations.

This information, or the "front-end" of ConnectYXE, will be accessed through a variety of venues ranging from interactive kiosks and public touch screens in malls, stores, and even main transit stops located throughout the city, to a phone app, to a website at a school, or a public library computer. Targeted locations throughout the city will have free Wi-Fi, to ensure ConnectYXE is as available as possible for those critical decision-making moments.

Collaboration among partners: creating a repository of data of all relevant programs and services available throughout Saskatoon. Community-based Organizations (CBOs) have been operating in an environment of resource scarcity and fragmented information. Those who participate in ConnectYXE will be provided coordination support and technological capacity to input their activity data into

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a data hub, the "back-end" of ConnectYXE. They will be able to access real-time services on an individual use-basis.

Harnessing innovative technology: connecting systems, sharing data and leveraging artificial intelligence. The collective data in ConnectYXE will provide a city-wide picture of what is available and the demands on those supports at any time. This enables CBOs, institutional partners, and decision-makers to regularly analyze and to identify gaps, trends, and better ways to respond.

The foundation of ConnectYXE is authentic and on-going engagement with Indigenous youth, community allies and institutional partners. This priority has been built into the governance model of ConnectYXE, with working groups engaging with each other and feeding into a decision-making Council comprised of youth, allies, institutional and technology partner representatives.

A whole-of-community approach, with youth at the centre, is needed to address the complex challenges that urban Indigenous youth face. These challenges are rooted in historical injustices, intergenerational trauma, and racism. And the cycle of family disruption, crime, and incarceration is both a human and economic tragedy that affects the entire city.

Cities across Canada are facing these same challenges, resulting in specific Truth and Reconciliation Commission Calls to Action that address them. Call to Action 38 is: We call upon the federal, provincial, territorial, and Aboriginal governments to commit to eliminating the overrepresentation of Aboriginal youth in custody over the next decade.

The challenge in Saskatoon is profound. Youth incarceration is double the national average. As youth move into the incarcerated adult population, 92 percent are Indigenous men and 98 percent are Indigenous women. The loss in human potential is immeasurable.

ConnectYXE can begin to transform the cycle of Indigenous youth incarceration into a healthy cycle. There is too much at stake if a new cycle is not created.

> *If I had ConnectYXE*
> *I would have been free*
> *Instead I spent three*
> *Wasted in a life that truly wasn't me*
> *Hoping for the best in the future*
> *I believe this is the true cure*
> *This is the seed to grow*
> *a community tree.*
>
> - MARIO, SMART CITIES YOUTH ADVISORY MEMBER

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01 Vision and Challenge Statement

Our vision is to transform Saskatoon into a city where Indigenous youth lead lives with purpose, belonging, security and identity. Our mission is to reduce the incarceration rate of Indigenous youth in Saskatoon to no higher than the rate in the nonindigenous population. Our approach is to empower Indigenous youth, their families and their communities to make smart decisions by accessing critical information in the moment they need it most.

> *If I had ConnectYXE*
> *I would have been free*
> *Instead I spent three*
> *Wasted in a life that truly wasn't me*
> *Hoping for the best in the future*
> *I believe this is the true cure*
> *This is the seed to grow*
> *a community tree.*
>
> - MARIO, SMART CITIES YOUTH ADVISORY MEMBER

1.1 Challenge Statement

Our challenge statement is to be the city that breaks the cycle of Indigenous youth incarceration by creating a new cycle focused on building purpose, belonging, security and identity.

Saskatoon is a growing city with a diverse population. On Treaty 6 Territory and Homeland of the Métis, it is the economic hub of Saskatchewan. As in all cities, growth and overall prosperity mask major inequities in both opportunity and outcome. Urban Indigenous youth face challenges rooted in historical injustices, intergenerational trauma, and racism. It is difficult to maintain cultural and spiritual traditions in the contemporary urban setting. Combined, these realities and experiences can deeply affect their sense of identity, purpose, belonging and security.

Among the consequences is an escalating cycle of family disruption, crime, incarceration, and alienation. This is both a human and economic tragedy that affects the entire city. Human potential is wasted. Children are forced to grow up too fast and navigate an often dangerous and hostile environment. Many lack the support or skills to make good choices. The programs and services meant to address these challenges are largely reactive. The criminal justice system warehouses young people in prisons at huge public expense, where they are more likely to become hardened career criminals than rehabilitated citizens.[1]

1 Government of Canada. Office of the Correctional Investigator. Backgrounder: Aboriginal Offenders – a Critical Situation.

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Community-based organizations (CBOs) do their best but the system remains fragmented; there are critical gaps in the capacity to respond to needs in real time, and most of the money is spent on repairing the damage rather than creating opportunities. The cycle becomes normalized and perpetuates itself through generations.

All cities want to solve these problems; in Saskatoon it is an urgent priority.

No one – not the youth and their families, the police and judicial system, CBOs, Indigenous leaders, business leaders – thinks the system is working now. To have different outcomes, we need a new approach. The adverse impact is enormous and will worsen over time. The gap between where we are and what we could be is wide. Therein lies the challenge and the opportunity.

Tragic statistics have spurred the Truth and Reconciliation Commission Calls to Action. Our ConnectYXE program would enable Saskatoon, and many other communities, to make direct progress on the following specific Calls to Action:

30. We call upon federal, provincial, and territorial governments to commit to eliminating the overrepresentation of Aboriginal people in custody over the next decade, and to issue detailed, annual reports that monitor and evaluate progress in doing so.

38. We call upon the federal, provincial, territorial, and Aboriginal governments to commit to eliminating the overrepresentation of Aboriginal youth in custody over the next decade.

These formative experiences replicate in the older adult population, where incarceration rates are at least five times higher than in the non-Indigenous populations.[2]

2 Estimates in this section are based on the following calculation: In Saskatchewan about 22% of the on-reserve Indigenous population is aged 10 to 19, of whom 60% are aged 12 to 17, our target population. Applying these figures to Saskatoon's 31,000 Indigenous population yields an estimate of (31,000 x .22 x .6) or 4092 Indigenous youths aged 12 to 17 for 2016.

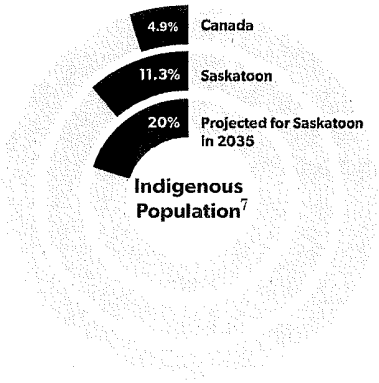
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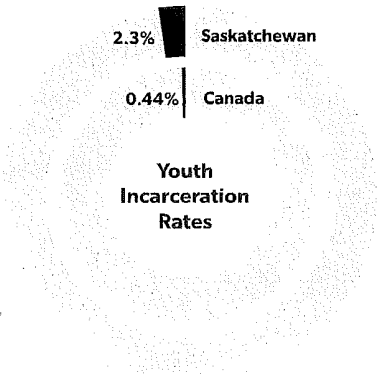
4,100
Indigenous youth in Saskatoon.[3]

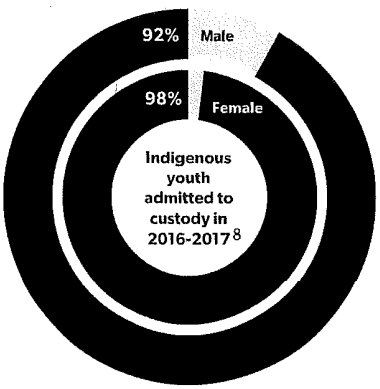
1,721
Youth incarcerated in Saskatchewan (Youth are ages 12-17).[4]

3.8x
Saskatchewan's youth incarceration rate is 3.8 times the national average.[5]

6x
Likelihood of incarceration of an Indigenous Youth as compared with non-Indigenous Youth.[6]







3 Saskatchewan Aboriginal Peoples 2016 Census ((http://publications.gov.sk.ca/documents/15/104388-2016%20Census%20Aboriginal.pdf)

4 Saskatchewan stat source: Statistics Canada, Table 11, Admissions of youth to correctional services, by type of supervision and jurisdiction, 2016/2017
National Incarcaration Rate for Youth (.44 https://www150.statcan.gc.ca/n1/pub/85-002-x/2018001/article/54972-eng.htm)

5 Saskatchewan rate of youth incarceration is 195 per 100,000 population. Canada is 50 per 100,000, making Saskatchewan 3.8 times the national average. (https://www150.statcan.gc.ca/n1/pub/85-002-x/2018001/article/54972/tbl/tbl09-eng.htm)

6 Jamil Malakieh, Adult and youth correctional statistics in Canada, Statistics Canada. 2016/2017. June 19, 2018. https://www150.statcan.gc.ca/n1/pub/85-002-x/2018001/article/54972-eng.htm

7 Statistics Canada, Census Profile, 2016 Census, Saskatoon City, Aboriginal Peoples. (https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/details/page.cfm?Lang=E&Geo1=CSD&Code1=4711066&Geo2=PR&Code2=01&Data=Count&SearchText=saskatoon&SearchType=Begins&SearchPR=01&B1=Aboriginal%20peoples&TABID=1)

8 Statistics Canada. Table 13 - Admissions of youth to custody, by Aboriginal identity, sex and jurisdiction, 2016/2017 https://www150.statcan.gc.ca/n1/pub/85-002-x/2018001/article/54972/tbl/tbl13-eng.htm

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1.2. The Approach

A smart city enables its citizens to use technology to make smart decisions.

The core of our approach is empowerment: equip Indigenous youth, families and allies with the information and the support networks to make smart decisions. This means that youth and Indigenous culture are central in how we build the technological solution. At our first meeting, the Elder we had invited said we need to find a way to bridge tradition and technology. Doing this will create an environment that enhances the opportunities and outcomes we aim to change.

The complexity of Indigenous youth incarceration cannot be solved by a simple solution. Listening to the voice of youth and their families was our first step. We invited CBOs and institutions who represent and provide services to at-risk youth to work with us. This became a committed coalition of partners. We worked together and with the youth to understand where to start and what could make a difference.

The insight that emerged was that the cycle begins with a series of harmful decisions. These decisions were often the result of preventative services being too difficult, or unknown to the youth, to access. By contrast, a series of well-made decisions can give a youth a plan. As one of the youth advisory members stated, "When we don't have information about where else we could go or what else we could do, we choose Plan A. With information, we could choose Plan B. B is for better."

It is in these moments of decision that the cycle of Indigenous youth incarceration can be broken. And based on this, we developed ConnectYXE.

> *ConnectYXE is not a provider of front-line services, it is a connector of those services to the youth, families, and allies who need them. It is like an Amazon.ca of services. Through Amazon, you can purchase a product that Amazon does not produce – rather Amazon connects you to the company that produces that service. ConnectYXE will connect people to the services being offered by CBOs and institutions in the city.*

ConnectYXE connects youth, their families and community allies with real-time information on services that are being offered, and the logistics they need to access those services. For example, when a youth finishes school for the day, ConnectYXE will give that youth the information to plan out their afternoon and evening: play pick-up basketball in a community gym, have a meal, find a place to sleep, or connect with an Elder or mentor. ConnectYXE will also provide information on public transportation options to reach their destinations. This information, or the "front-end" of our technology, can be accessed through a variety of venues ranging from interactive kiosks located throughout the city, to an app, to a website at a school or public library computer. Targeted locations throughout the city will have free Wi-Fi, to ensure ConnectYXE is as available as

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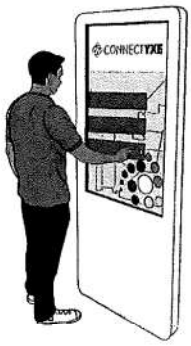
possible for those critical decision-making moments. Self-determination and self-actualization are critical in supporting youth to make their own decisions.

ConnectYXE also provides coordination support and technological capacity to CBOs who have been operating in an environment of resource scarcity and fragmented information. CBOs who are part of ConnectYXE will provide their activity data into a data hub, the "back-end" of our technology. They will be able to access real-time services on an individual use-basis. In addition, the collective data will provide a city-wide picture of what is available and the demands on those supports at any time. This enables organizations and decision-makers to regularly analyze and to identify gaps, trends, and better ways to respond.

A "Use Case" – a step-by-step narrative that describes user's interactions with a system – illustrates how ConnectYXE might function.

1.2.1 An illustrative Use Case: Youth is looking for short term housing

This illustrates the planned functionality of ConnectYXE using a scenario that emerged from the Youth Engagement Workshops. In this scenario a youth finds for one reason or another that he or she cannot sleep at home for that night.



YOUTH	YOUTH	CONNECTYXE	YOUTH	CONNECTYXE
finds access point to connect to the internet	connects to ConnectYXE	asks how it can help	asks if there is a place to spend the night	locates accommodation available and reccommends an option

YOUTH	CONNECTYXE	CBO	CONNECTYXE	YOUTH
accepts recommendation of a meal and conversation	references history of requests and determines services frequently bundled with a request for a bed. System offers a meal, and a meeting with an elder	advised to expect a youth for the evening	communicates to CBO that a youth has requested a bed for that night. System may put "hold" on a bed. List of available beds is updated	accepts recommendation

CONNECTYXE	CBO	CONNECTYXE	YOUTH
locates meal for the youth	A meal-provider is advised that a youth has requested a meal for that evening. A cultural CBO receives a request that an elder join a youth for a meal	asks if the youth would like transportation arranged to the location of the meal, and/or to the location of the overnight housing	the youth accepts the offer of transportation

YOUTH	CBO	CONNECTYXE	YOUTH	CONNECTYXE
Takes transit to the location of the meal. He or she meets and shares a meal with an elder, then travels to the location for overnight housing	Saskatoon Transit issues a free ride or rides. This is communicated as a token to the youth's phone, or to the bus	arranges for bus pass with Saskatoon Transit	accepts transportation offered	connects to Saskatoon Transit and determines transportation alternatives. The BOT offers these to the youth

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Our strategic approach is grounded in the following three outcomes. Examples of outputs are included below; a complete picture of how we are measuring outcomes is in the Performance Measurement section.

1. Empowerment of Indigenous youth and their families. This includes providing real time information and options on how to access services; ensuring information is available throughout the city, every day, all day. These will be measured by outputs such as: number of queries to the system from public kiosks or websites; number of users; and level of uptake of services.

In the finalist phase, significant progress has been made through consultation with youth to identify what information and services, would make the most difference to how they make decisions.

2. Collaboration between partners. This includes creating a repository of data of all relevant services available throughout Saskatoon. Outputs will include: number of CBOs, programs and services in the database, number of partnerships with CBOs, number of trend reports produced.

In the finalist phase, we have developed and strengthened partnerships with both CBOs and institutional partners who have agreed to provide data, participate in our governance, and assist in implementation of ConnectYXE. Their commitments are described in their Letters of Support in Appendix Five. We have also worked with them and the youth to identify the preferred order of onboarding of services, based on the priority given by youth and the readiness of the partners involved.

3. Harnessing of innovative technology. This includes connecting systems, sharing data and leveraging artificial intelligence to:

a. Enhance understanding of support-seeking behaviours and have insight into patterns to improve service coordination;

b. Enable continuous refinement of programs and services in response to real-time insights generated by ConnectYXE;

c. Identify critical gaps in programs and services that create barriers to better outcomes.

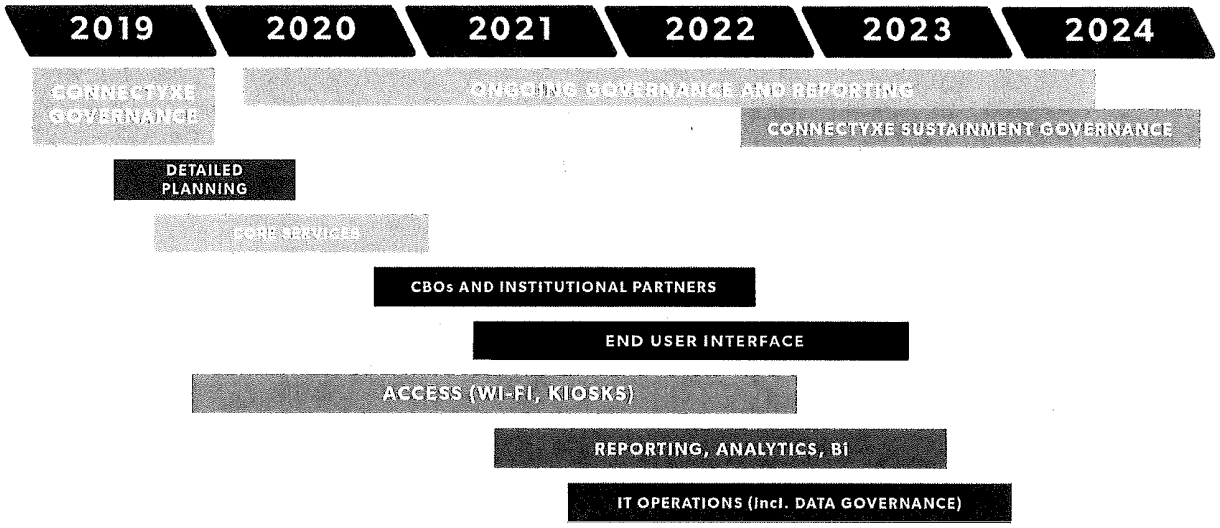
Outputs include number of community needs reports produced and number of trend reports produced

1.3 Implementation Plan

The ConnectYXE Program has a five-year plan. We will first develop our governance structure and processes followed by a detailed analysis of the systems and infrastructure of our CBOs and institutional partners. From this, we will build our core system (the back-end) and the interfaces to connect to and incorporate our CBOs and institutional partners. In a parallel track, we will initiate the projects that deliver the User Interface to youth, their families and allies (the front-end). Real benefits will

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begin to multiply as youth are then able to use to the system to connect to a growing set of options and services, and as our partners will be able to perform analyses and gather insights based on aggregation of the data. We will build this program to transition to an independent sustainable organization. This figure demonstrates the multiple streams of our plan and the mix of technical and non-technical projects.



FIVE-YEAR IMPLEMENTATION PLAN

1.4 Years of Collaboration Is Our Foundation

This program is not the starting point; it is the culmination of years of deliberation, community engagement, collaboration, and mobilization. The history of our engagement is detailed in Section 2, "Community Engagement Journey."

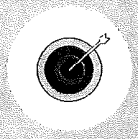
To frame and develop the challenge statement for this program, we designed engagement workshops to identify and prioritize issues and to fuse the narrative of at-risk Indigenous youths with rigorous thinking about pathways to improvement. Over the course of eight workshops we refined the challenge statement into four pillars, developed by the youth and their allies.

Embedded in each pillar is mentorship and culture. Youth recognized that positive adult support, both on a regular basis and in crisis situations, is critical to building capacity to make good decisions. They also expressed a desire to connect with their cultural traditions to strengthen their sense of self and develop a sense of belonging.

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Security: The overall top priority for the youth. Within that, the main priorities are housing security and public safety. Security also includes food, financial, family security, and accessibility (transportation) to services.



Purpose: Helping individuals feel motivated and comfortable, and empowering those individuals to help themselves and others make life better.



Belonging: A genuine sense of attachment to important elements of community and how it positively shapes their understanding of self and their place in society. Belonging can refer to any or all of the home, family, community, workplace, and other structures.



Identity: Knowing who they are, where they came from; a foundation for self-mastery and pride, expressed in values, personality, sense of autonomy; the product of historical culture, place, inherited and discovered elements; a source of inspiration and strength.

1.5 ConnectYXE Program is Transformative, Scalable and Replicable

Our ambition is to change relationships, systems and outcomes. We have designed a program that will be transformational. It is built upon an underlying logic, experience-based learning, and co-design by a diverse and committed partnership. Our approach is both ambitious yet cognizant of the multi-faceted challenges that are part of reducing Indigenous youth incarceration rates.

ConnectYXE program will be scaled up to include more communities, increased CBOs, programs and services, and additional technological advances as we progress. Particularly related to technology, predictive analytics and artificial intelligence are already being used for many commercial purposes and in everything from health care to transit planning. They are powerful tools for dealing with complexity over time, where effects have multiple causes, key factors interact to magnify socio-economic risks, and individual circumstances can vary greatly from day to day. Scaling our program towards incorporating these technology tools will magnify and expand our impact.

Our challenge is tragically one that many communities across Canada struggle to address. ConnectYXE has the potential to be expanded or adapted to other communities, and to include other related issues.

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Among the main innovations of the program are:

1. It is grounded by the insight that success comes from empowered youth making good decisions in critical moments. This respects the agency of Indigenous youth.

2. It addresses problems defined and described by the people we are aiming to help: Indigenous youths, their families and allies.

3. It targets an outcome that improves the quality of life for at-risk individuals and their families, and the entire city. Reducing incarceration changes lives, increases safety and well-being for everyone, and reduces costs from the program level up to provincial and federal budgets.

4. It envisions a systems approach to systemic problems. All partners recognize the need to change. They are committed to informed experimentation, evaluation, and agile adaptation.

5. It aims to unleash the power of information at all levels:

   a. Create a network of access points that provide vital information for Indigenous youth to get the help they need when they need it.

   b. Integrate data to identify at-risk youth, tailor supports to individual needs, and identify what works, what doesn't, and in what circumstances.

   c. Enhance understanding of how Indigenous youth use programs and services to inform decisions about how they might be better organized and deployed.

   d. Record and analyze patterns to identify risks, coordinate services, reduce inconvenience and redundancy, and stimulate new approaches. Collaboration and coordination are currently thwarted by the absence of information and connectivity.

6. It is financially feasible and sustainable. It does not require transformational success in a short time period to produce a return on investment.

The Economic Costs of Failure

Continuing the over-representation of Indigenous people in the justice system instead of investing in education and alternative measures will cost Saskatchewan alone as much as $13 billion over twenty years.[9]

Every youth who gets caught in the cycle of despair and crime costs society an enormous amount of money. **Incarcerating one youth costs the province approximately $75,000 per year.**[10]

1.6 Turning Around Unrealized Economic Potential

The costs of dealing with the consequences of criminal behaviour are sub-

9 Estimates in this section are based on the following calculation: In Saskatchewan about 22% of the on-reserve indigenous population is aged 10 to 19, of whom 60% are aged 12 to 17, our target population. Applying these figures to Saskatoon's 31,000 indigenous population yields an estimate of (31,000 x .22 x .6) or 4092 indigenous youths aged 12 to 17 for 2016.

10 http://publications.gc.ca/collections/collection_2018/dpb-pbo/YN5-152-2018-eng.pdf

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stantial, but the economic impact does not stop there. Far more significant is the lost opportunity to participate in and contribute to the broader economy, which has a direct impact on a youth's sense of purpose, identity, belonging and security. Yet the current trend sees the general population unemployment rate at 5% while the Indigenous unemployment rate is 15.1%.[11]

There is a great deal to do. The Indigenous youth high school graduation rate hovers around 50%. Lifetime earnings double for Indigenous high school graduates.[12] It is estimated that the educational gap between Indigenous and non-Indigenous people costs Saskatchewan over a billion dollars a year in lost economic productivity.[13]

Even a small investment can generate enormous returns. An incarcerated youth conservatively costs approximately $73,632 a year, and once incarcerated, the likelihood increases that the criminal youth will become a criminal adult. The lifetime costs of further incarceration, addiction services, income support, and other supports reach into the millions. If the program empowers only 3 or 4 of the 4,100 youths each year to choose to complete high school and avoid crime, the combination of reduced costs and positive economic contributions to society over a lifetime will produce a net benefit in the millions of dollars for each one.

The workforce of tomorrow will have to be significantly Indigenous if the province is to prosper. The problem cannot be quarantined; **the future of Saskatoon, and this nation, is inextricably linked to the future of Indigenous youth.**

The Case Study of Nanna

The Province of Saskatchewan and our technology partner, Information System Management (ISM), did an analysis of the program usage of one family and the impact on costs. This case study is focused around 'Nanna' who is in her late 50s, has four children, 19 grandchildren and one great-grandchild. Nanna and her children have never been employed. Nanna received support from six different community-based organizations, suffers from depression, addiction, was a victim of abuse and was apprehended as a child. Her family continually struggles with alcohol and drug abuse, domestic violence, child neglect, gang activity and other issues.

The Province and ISM estimate that program costs to support Nanna's family range from $5-7 million annually and forecasting forward to the next generation this number increases to $17-19 million. There are 2,500 families like Nanna's in Saskatchewan. This case study emphasizes the urgency of breaking the generational cycle of trauma, both because the costs to sustain people being supported to this extent are significant, and more importantly, the costs to the family in lost opportunity are devastating.

11 http://publications.gov.sk.ca/documents/15/100460-lfsJuly2016.pdf

12 Howe, Eric C. Mishchet aen kishkayhtamihk nawut ki wiichiihtonaan : Bridging the Aboriginal education gap in Saskatchewan. Saskatoon: Gabriel Dumont Institute, 2011.

13 Soonias, S., H. Exner-Pirot, M. Salat and A. Shah. City of Bridges: First Nations and Métis Economic Development in Saskatoon & Region. SREDA: Saskatoon. April 2016.

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1.7 Bringing ConnectYXE to Our Community

We began our Smart Cities journey knowing we wanted to find a way to address safety and community well-being. Over the past year, we have been inspired by the courage and generosity of the Youth Advisory Group, the dedication shown by the front-line organizations and community allies, and by the commitment of the institutional partners who are prepared to break out of silos and make systemic change. We have built relationships over this past year that will weather the challenges of the future, a future that includes moving forward to build a new cycle of identity, purpose, belonging, and security for Indigenous youth.

> *Had ConnectYXE been available a few years back, perhaps my decisions as a teenager wouldn't have been so misguided. I would have had direct access to mentorship, recreation, or even that art class I always wanted to take. Instead of sneaking my friends through the window so they had somewhere to sleep, we could have found a better solution. This technology is going to answer questions we all as youth, struggling or not, need an answer to. It'll guide us places we deserve to be.*
>
> - MORGAN, SMART CITIES YOUTH ADVISORY MEMBER

ConnectYXE Will Be Built

The experience of the past year with the youth and partners has convinced the community of the important need for ConnectYXE. There has been a commitment made by many organizations in the community to work with the City of Saskatoon in finding a way to deliver ConnectYXE, in all or part, regardless of the Smart Cities Challenge final result.

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02 Community Engagement Journey

2.1 Introduction

Engagement has been and will continue to be at the heart of the ConnectYXE program. We developed our challenge statement as the result of comprehensive community and stakeholder engagement. The success of our program will depend on how well community members are engaged in both the design and implementation. Key objectives are that program and platform models are evidence-based, informed by stakeholder input, and address the barriers and needs of the youth, youth supporters, and community-based organizations (CBOs). Achieving this will require a deep and sustained level of community engagement throughout the program lifespan. The governance model as shown in Section 6 "Governance" provides a clear picture of these relationships, and their role in decision-making. This engagement process will continue to involve building relationships, establishing trust and understanding, and continuing communication.

> *Community Engagement increases community cohesion and allows for the community to have ownership over the outcomes that will ultimately impact them.*
>
> -TAMARACK INSTITUTE

2.2 Where We Have Been

good, extensive engagement

The table below outlines key elements of the engagement process to date.

Stakeholder Group	Sessions	Engagement Techniques
Youth Advisory Group	5	• **Sharing Circle:** Elder leading a smudge, opening & closing the circle; sharing life stories • **Scenario Mapping:** describing day to day routines in detail to pinpoint and identify gaps and opportunities Priority Identification: arriving at key project priorities, desired purpose and impacts, and key constraints • **Design Thinking:** exercises to encourage creative thinking, and tactile activities such as building their ideal neighbourhood and creating user personas
Institutional Partners Table	4	• Input meetings • Discussion around current progress of the program • New ideas and feedback on where ConnectYXE activities could be helpful • Identifying which administrative units would be appropriate to help out in certain sections • Governance Planning session to provide input on governance model design
Community Allies Advisory Group (including CBOs)	2	• **Feedback Forums:** sharing youth feedback, providing a chance to ask questions and share current work, activities to identify gaps and opportunities, and share new ideas for the challenge • **Scenario Mapping Workshop:** built upon the youth maps, adding comments, questions, and ideas
Technology Advisory Group	2	• Input meetings • Reviewed and built upon the ideas developed in the Youth Advisory workshops • Added in comments, ideas, questions regarding scenario maps and what types of solutions could be implemented • Brainstorming session

TABLE 1: ENGAGEMENT PROCESS TO DATE

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The program team also conducted eight meetings with individual institutional partners to identify areas of support and collaboration and convened a group of 50 staff and volunteers from 20 different CBOs in the housing and food sector for a presentation and discussion about the project.

To ensure that Indigenous youth with lived experience had a central voice, the team reached out to community groups and agencies. These organizations identified youth with whom they had established relationships and invited them to join the Youth Advisory Group. The youth represented a range of age, backgrounds and in-crisis experiences. From the beginning, the Youth Advisory Group has involved an Elder and traditional approaches through teachings, sharing circles, and continued support through the process. This intentional approach has built trust between participants and has created a safe space for exploration.

2.3 What we have learned

Over the course of the engagement, we identified several key insights that have shaped the current proposal.

Key Insights	Source	How they shaped the proposal
Dependence of youth on several key services – ex.transportation	Youth Advisory Group	Helped to prioritize services and what we should be onboarding first
Importance of traditional knowledge and culture	Youth Advisory Group	Led us to see identity not as a separate pillar but interwoven
Importance and impact of positive adult support for youth	Youth Advisory Group	Reinforced the importance of mentorship as key part of the project strategy
Importance of ongoing communication and relationship building	Institutional Partners	More consistent engagement approach with clear roles, expectations, and responsibilities based on capacity
Need to focus not just on youth as individuals but working with their families and allies	Youth Advisory Group and Community Allies	Important to involve community allies and support systems when working with youth. Our focus went from being simply on youth to understanding the importance of youth supports and allies and how they will also use the technology.
Role of CBOs and differing levels of capacity and technological maturity	Community Allies	Important to respect and reinforce the work of CBOs and their importance to the solution; Created a 3-tiered technology maturity strategy to ensure CBOs are on boarded easily.
Collaboration between technology and community worlds	Technical	To bring the two areas together at an earlier stage to understand the social complexities from the community view and the technological complexities and possibilities from the other side.

TABLE 2: INSIGHTS LEARNED FROM ENGAGEMENT ACTIVITIES

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Our team has learned that the different stakeholder groups approach the program from different perspectives, which impacts how we engage them. For example, institutional partners are most focused on big picture strategy, while community allies are most focused on operations, and the youth tend to focus on immediate use and current situations. To address this with CBOs, we started acknowledging their operational realities and shorter-term needs before moving into strategy and vision conversations. We are now customizing our approach to each group. By portraying how everyone contributes to the whole, we have also seen more ownership and empowerment among participating groups

We must continue to build trust with partners so that they are willing to be candid about their challenges and processes and areas that need improvement. This is essential to design services that will truly work for all users and espouse confidentiality.

2.4 Where We Are Headed

2.4.1 Guiding Principles

Good

We have identified seven guiding principles that will be embedded in the engagement approach. These values will assist in creating meaningful participatory processes and in building ownership within the community.

1. Inclusivity and Diversity: Ensuring that all affected and interested groups are involved, with proactive inclusion of groups that may be marginalized or facing barriers.

2. Honouring Treaty Responsibilities: Bridging the distance between Indigenous and settler worldviews on wellness of the individual, family, and community. (see Section 11.1 for full description)

3. Transparency: Open and consistent communication about the program. Commitment to explaining decisions, why they were made and how input was used.

4. Deliberation: Creating environments that encourage sharing, vulnerability, and provide opportunities for participants to shape solutions and work toward consensus.

5. Influence: Engagement must inform and shape decisions. Participants understand their level of influence and are involved in the decisions that most affect them.

6. Accommodation: Using approaches that will welcome a diversity of voices and ensure convenient, accessible methods of participation.

7. Ongoing and Iterative: Engagement continues throughout the project lifespan and will be adapted based on feedback and learning.

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2.4.2 Decision Making Process – Governance

The Governance model described in Section 6 has a direct connection to the engagement plan. This is because engagement is about working with the community to have ownership over the outcomes that will ultimately impact them. The engagement process is always linked to decision-making, and therefore to governance. As the governance model evolves, so too will the engagement plan.

The ConnectYXE Council is the ultimate decision-maker. The Advisory Groups and Working Groups are at a collaborate level. There will also be engagement beyond these formalized structures, at a variety of levels. The program team will look to these governance groups for support with designing and leading engagement efforts to ensure they will resonate with the intended participants.

2.4.3 Community Relationships

The table below outlines the main stakeholder groups that have been and will continue to be engaged through the course of the program.

Key Stakeholder	Level of Engagement	Engagement Mechanism	Description	Purpose or Role
Youth with lived experience	Collaborate	Youth Advisory Group	15 Indigenous youth representatives recommended by 9 youth-serving agencies in Saskatoon	Provide lived experience voice to share experiences, identify needed supports and prioritize needs; foundational input for the program focus and approach
	Involve	Design and Testing Workshops or Stations	Wider group of Indigenous youth to engage with user experience design and testing	Provide lived experience and user voice to the process, ensure diversity of users are engaged
Government and Public Institutions	Collaborate	Institutional Partners Table	Representatives from 11 public institutions and levels of government, including Indigenous government	Provides overall strategy and approach based on input from lived experience and community, involved in developing governance model
	Involve	Individual Meetings	Meetings with individual institutional partners	To identify areas of program and data support that aligns with the ConnectYXE program
Community Based Organizations & Allies	Collaborate	Community Allies Advisory Group	25 organizations with a primary focus of working with at-risk youth in Saskatoon	To build awareness of ConnectYXE and gather ongoing input
	Involve	Outreach Meetings	Organizations from housing, food, recreation, and cultural sectors	To build awareness of ConnectYXE and gather ongoing input
Technology Partners	Consult	Technology Advisory Group	Representatives of key technology partners	To provide input and guidance with respect to the technology solution
	Collaborate	Weekly Update Meeting	Meeting with ISM as major tech partner	To build on the platform to support development
Residents	Inform	Communication Channels	Communications of key program milestones and opportunities for involvement	To keep interested residents aware of the program, key milestones, and ways to support

TABLE 3: ENGAGEMENT ACTIVITIES

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2.4.4 Projected Engagement Goals and Activities

The table below outlines projected activities that correspond with an engagement goals. This represents an iterative and agile-thinking approach to the engagement processes.

Engagement Goals	Activities
1. Broaden the base: all appropriate supports and stakeholders are engaged and involved in program development. Active participation of Indigenous-led groups and allies.	• Identify and build relationships with Indigenous and community-based service providers, organizations, and allies that have not yet participated. • Reach out to service providers in neighbouring First Nations outside the city to identify possible partnerships and involvement (because of the high rate of migration between surrounding reserves and the City). • Solidify governance model through participatory involvement of stakeholders, and ensure clear understanding of purpose, roles, and responsibilities of various bodies. • Recruit for membership within working groups.
2. Gain a holistic picture: stakeholders are deeply involved in needs assessment processes to ensure barriers and needs of youth, youth supporters, and CBOs are addressed in the design	• Convene collaboration and input workshops with community allies to test the scope of current initiatives and gain feedback • Involve working groups in needs and opportunity assessments • Continue to support youth advisory group and build processes for onboarding new members if there are transitions • See goal #5
3. Build trust and change-readiness: CBOs see program value, feel respected, and are ready to make changes to support the program success. Participants have trust in the program; are willing to disclose what's not working and to express ideas that may be uncomfortable.	• Ongoing communication about program status, opportunities for participation and influence, and next steps. • One-to-one relationship building meetings with CBOs to build deeper understanding of operational realities and to discuss what's working and not working. • Create guidelines for advisory and working groups that emphasize importance of confidentiality, non-judgement, and productive discomfort. • Facilitate a series of workshops that build social capital and trust among participating groups, using a variety of facilitation methods for courageous conversations.
4. Strengthen community interconnections: enhance awareness and connections between service providers, to promote reinforcing activities and reduce unnecessary duplication. Work in a way that advances community reconciliation.	• Through engagement gatherings, create a collective system map of what each CBO is doing, and where there are overlaps, gaps and opportunities. • Broker partnerships and collaborative activities between CBOs, as appropriate, to leverage other strengths. • Convene courageous dialogue about areas of possible duplication or necessary redundancy. • Indigenous inclusion at every layer of the program and its governance, including both membership, cultural protocol, and modern treaty considerations.
5. Iterate based on testing and feedback: leverage design thinking approaches to put users at the centre of development and iteration. Ensure the right people are engaged at the right time in key design phases.	• Build capacity in design thinking methods and tools, increase stakeholder familiarity and comfort with these processes. • Host prototype testing experiences with incarcerated youth, affected families, youth advisory group, community allies, and members of the broader public. • Host feedback forums to gather feedback from institutional partners, subject matter experts, and other key allies.

TABLE 4: PROJECTED ENGAGEMENT GOALS AND ACTIVITIES

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2.5 Communications, Marketing and Change Management

Communication to and from the youth, partners, and broader community will be a key activity towards building ConnectYXE success, and organizational and social change. Once ConnectYXE has been identified as a successful program, we will develop a communications plan that will include a news release and media announcement event, social media content shared across the City's Facebook, Twitter and Instagram channels, and updates on saskatoon.ca/smartcities.

We will then begin the next steps of program development and implementation. When ConnectYXE is ready to be launched to the community, we will create awareness by using a combination of advertising elements using both digital (social media, search engines, online) and traditional (radio, print, billboards, posters) media.

In the lead-up to the launch, we will work with the youth advisory group to develop plans for how best to reach other youth. We will also work with institutional partners and community allies to identify the best way for them to market ConnectYXE through their networks and how we can support them to do this.

After the launch, we will develop training and resource materials for onboarding additional CBOs to ConnectYXE and use these when approaching targeted groups to invite to ConnectYXE. We will also host information sessions for the general public to understand how ConnectYXE works, while at the same time using this as an opportunity to test it as part of an on-going iterative development process.

ConnectYXE will introduce a new tool and new ways of thinking about how youth, their families and their allies might find available options and services. The program will be successful only if those end users actually use the service – that is, change how they do things. Introducing a change in the way individuals think and act is the discipline of Organizational Change Management (OCM). The change we seek to achieve is the use of ConnectYXE to make informed decisions.

ConnectYXE incorporates two frameworks to achieve the art and science of OCM: the McKinsey 7S model, and the PROSCII model. These formal methodologies have these broad steps in common:

- We identify what change we are introducing
- We identify who is impacted by the change, and
- We identify who influences whom

Based on this, we then seek to introduce the change in a managed way:

- We start by creating "Awareness" of the change
- We communicate the potential advan-

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tages of the system, to build "Desire"

- Then we provide information as to how to use the system – or to build "Knowledge"

- We work with our users to build skill or proficiency is using the system – or to build "Ability", then

- We seek to "Reinforce" the newly-learned behavior

This "ADKAR" framework will – like other aspects of the ConnectYXE program -- evolve as we learn from early deployment efforts, as we listen to our end users, and as we monitor and measure the adoption of the solution.

2.6 Issues & Risk Identification

Risk Management cuts across each of the sections of this proposal, and risks frequently overlap domains. We have consolidated the risks, and the discussion of the risk log in Section 9 "Risk Management". We have provided our current risk log in its entirety in Appendix Four: Entire Risk Log.

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03 Technology

Using a technology-based solution to address a social issue such as breaking the cycle of Indigenous youth incarceration is ambitious. We believe technology can play a critical role in connecting Indigenous youth, their families and allies, with a wider range of choices, empowering them to make decisions, and to seize existing opportunities. Technology can be a tool to help connect them to people, programs, and activities related to their cultural identity, that enhance their sense of life purpose, that give a sense of belonging, and provides security.

3.1 What is ConnectYXE? An Overview of the Technological Solution

ConnectYXE is both a data hub of programs and services (the back-end) as well as multiple interfaces for youth, their families, their allies and service providers to access those programs and services in real time. For example, access to the service will be available using a phone, a computer in a public library, or a public touch screen in a mall (the front-end).

Each Community-Based Organization (CBO) and institutional partner presently provides a subset of these services for youth and their families. However, they often work in isolation. ConnectYXE will collect existing programs, services and capacity information and connect it to youth, their families and their allies, in the moments they need it most.

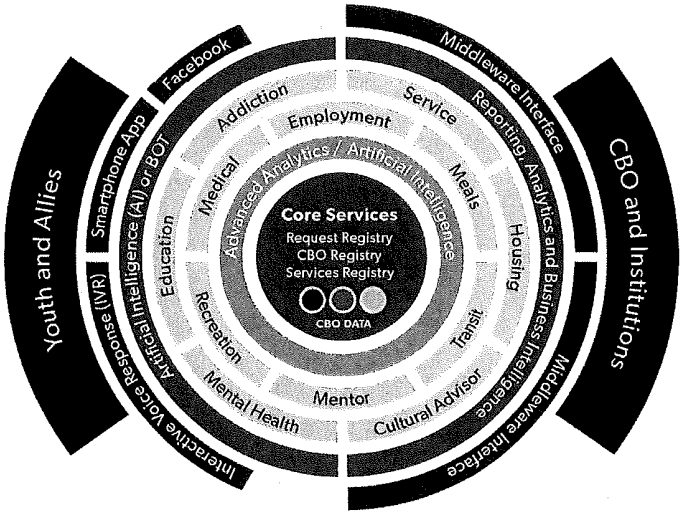


FIGURE 1: CONNECTYXE INTERFACE LAYERS

Through analytics, ConnectYXE will provide a city-wide picture of what services are available and the demands on those supports at any time. This can be used by organizations and decision makers to identify gaps, trends, and opportunities, and recommend policy and program changes.

In this section, we explore each of the elements of the technological solution shown in the image, and "build" the system conceptually layer by layer.

We discuss data and privacy in detail in a subsequent section, but at this point we are clarifying that we will not collect data that contains personally identifiable information (PI) or Personally Identifiable Health Information (PHI).

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3.1.1 Core Services

The core of ConnectYXE is a repository of data from CBOs and institutional partners, services those organizations offer, and a repository of requests. Data from CBOs and institutional partners reside here in the form in which it was received from the partner organization. This design is modeled after Saskatchewan's Social Innovation Hub (SIH), developed with our technology partner, Information System Management (ISM).



FIGURE 2: CORE SERVICES

Detailed planning of the system core will include several elements:

- **Core Services** provide access to the system for administrators and partners. A secure process to log into the system will allow administrative users to access their own data. Authentication (that is, who logs into ConnectYXE) is discussed in Section 7.2 "User Access".

- **Requests** collect the metadata associated with requests by youth, their families and their allies. Collecting and analyzing this data can identify metrics associated with the system, which will help CBOs determine services that are most in demand and those service requests that most often cannot be met.

- **A Registry of CBOs** collects key organizational data about the CBO. This information is used to implement and maintain interfaces as a part of the Core Services.

- **Contacts** are integrated to both the authentication service and the repository of CBOs. This data will maintain roles and contact information.

- **CBO Data** is provided by CBOs and partners in their own format, sidestepping a long and difficult effort by each partner to transform into a highly structured/normalized model. *Note: Each CBO's data is isolated from other CBO's data. Staff from a given CBO will be able to view only their own data.*

Is ConnectYXE a Tool for Case Management?

The design outlined in this section specifically calls for a system in which the identity of an end user is not identified. While we recognize potential benefits of tracking and recognizing trends in the interactions of an individual, respect for the privacy of the end user has prevailed. The system is *not* designed to be a Case Management System.

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3.1.2 Core Interface with Advanced Analytics

Advanced Analytics are built into the Core Services of ConnectYXE through the Registry Interface. This interface includes enhanced Artificial Intelligence (AI) – a variety of AI tools – to bridge the gap between data received from CBOs and the services offered by ConnectYXE.

Data provided by CBOs and institutional partners stored in the core will be both structured and unstructured. Highly structured and normalized data, for example, is housing data or data about recreational services stored in a database. Highly unstructured data might be published in a document or maintained on a spreadsheet that is stored on a server or on a local workstation of a CBO.

Knowledge from this data will be extracted using a set of Advanced Analytics tools and methodologies. This approach is trusted and used in a similar fashion to extract meaning from disparate data sets in the Saskatchewan Social Innovation Hub. AI is used to help deliver the right information, at the right time.

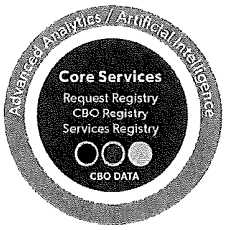


FIGURE 3: CORE INTERFACE WITH ADVANCED ANALYTICS

3.1.3 Services Offered by CBOs

The primary function of ConnectYXE is to connect organizations providing services to Indigenous youth and their families. These service connections will live in the Services layer of ConnectYXE. This information is populated by the Advanced Analytics Interface from CBO data maintained in the core.

Initially the services provided will start with Meals, Housing, Transit, Recreation, Cultural Interactions, and Mentorship. Additional services will be added as CBOs are on-boarded under the direction of ConnectYXE program governance.

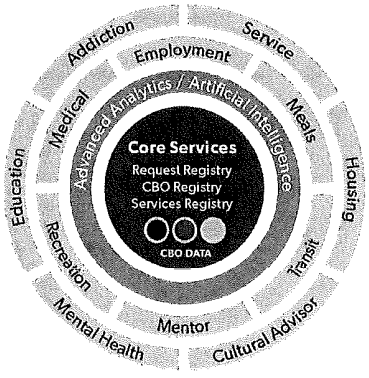


FIGURE 4: SERVICES ONBOARDED

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3.1.4 A Public Request Interface Enhanced Through Artificial Intelligence

A Public Request Interface is where youth who are requesting services can interact, make requests, and receive context-sensitive information to enable them to make informed decisions. It acts as a layer brokering the interactions between the youth and the services. This public layer is enhanced by a Chatbot utilizing Natural Language Processing (NLP) and other forms of Artificial Intelligence (AI).

This feature is a differentiator of this proposal. It allows users to interact with the system in language and terminology that is meaningful to the youth. Whether the youth is speaking to the system using a phone or is "talking" to the system using text, the Chatbot can be a primary handler of conversational interactions.

Chatbots are becoming more prevalent. Apple's *Siri*, Amazon's *Alexa*, Microsoft's *Cortana* and Google Assistant are examples of interfaces that are on a smart phone or voice-activated personal assistant, or as a first encounter in calling customer service at several companies.

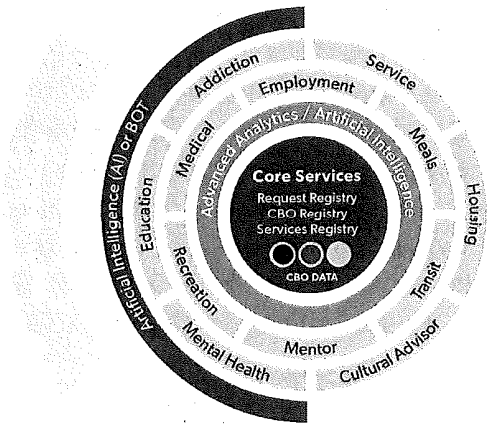


FIGURE 5: ADDITION OF ARTIFICIAL INTELLIGENCE

A Chatbot can be implemented in multiple languages. Future iterations of ConnectYXE may provide access in French. As the vision of ConnectYXE is scaled beyond the immediate objectives, the front end can be enhanced to speak other languages.

3.1.5 User Front End

A layer of web services wraps the public request interface to provide a seamless experience connecting the user to the service they need. Social Media and interactive voice response will allow youth, families and allies to interact with ConnectYXE by whatever method suits them. Together, with the front-end options and the Chatbot, information on programs and services will be available 24/7 with an interactive experience.

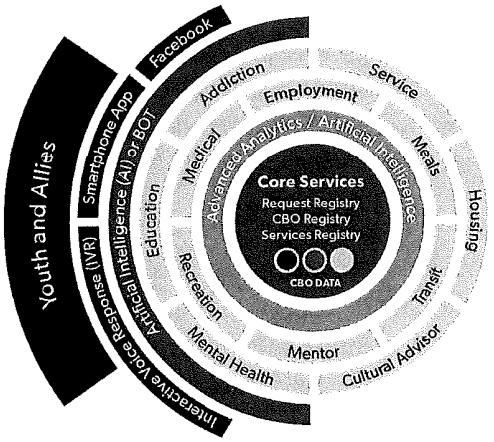


FIGURE 6: USER FRONT END

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ConnectYXE Public Interface Uses Two Forms of Artificial Intelligence

Artificial Intelligence, or AI, is used in two distinctive ways in ConnectYXE's Public Interface.

The AI Chatbot handles the phrasing and conversational interaction, working with short, snippet-based conversation. Examples are phone calls, text message or a Facebook conversation or post. It uses Natural Language Processing and can "learn" from previous conversations.

The second AI dimension is learning what a person is looking for, even when they have difficulty articulating their needs in terms of services. Here, AI tools search for relationships in data. This is Advanced Analytics or machine learning applied to the ConnectYXE context.

In ConnectYXE, data will be analysed by a rich set of analytic tools in the ISM Data Lab. The richness of the analytics, too, grows over time.

3.1.6 Operations Interface Supporting Reporting, Analytics and Business Intelligence

ConnectYXE includes an operations interface comprised of reports, analytics and business intelligence (BI). This interface includes prepared reports that will be available to authorized partners (e.g. CBOs, institutional partners, etc.) This interface layer will support the exchange of data between ConnectYXE and each partner.

ConnectYXE partners – CBOs, Institutional partners, policy makers and researchers will connect to these reporting, analytics and BI services through a web portal. They will have access to information that is related to their services that will allow them to understand the efficiency of the programs they provide, and also understand the landscape of the entire city to understand what the needs are of at-risk youth. This allows them to understand the funding required to run their programs and which social services are at greatest demand. The intelligence gathered will allow us to position social services funding to optimal advantage.

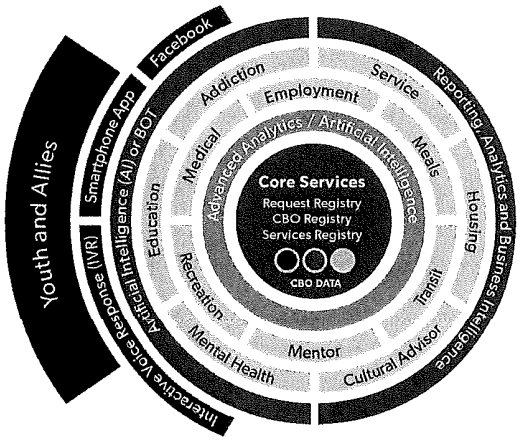


FIGURE 7: ADDITION OF OPERATIONS INTERFACE

A report is analogous to driving a car while looking in a rear-view mirror while Business Intelligence is analogous to looking through the front windshield.

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A Partnership with Saskatoon Housing Initiative Partnership (SHIP)

The Government of Canada National Homeless Individuals and Families Information System (HIFIS) has developed a software solution to enable CBOs to manage shelter and food services, and to share and collaborate their current status and use. In Saskatoon, SHIP is working to promote the use of the current version of HIFIS. CBOs that sign-on with HIFIS publish available shelter space and meal information. This makes SHIP an ideal partner for ConnectYXE-IFIS data are available to ConnectYXE by an Application Layer Interface (API) that has already been developed. This means that the rich dataset maintained by HIFIS for shelter housing and for meals is available to ConnectYXE.

Conversely, ConnectYXE promotes the objectives of SHIP and works to promote the adoption of HIFIS 4.0. As ConnectYXE onboarding process identifies CBOs that do not have a technical solution to managing services, the program will work with HIFIS to meet that need.

3.1.7 Middleware Connector

A middleware layer will connect the data repository to ConnectYXE partners. This is a set of APIs that pull data from our partners' data sources. The nature of the interface will depend on the level of IT maturity of the CBO or institutional partner. Each partner will have a different level of technological maturity. This is discussed further in Section 3.5 "Technical Onboarding of CBOs and Providers".

ConnectYXE is not imposing a standardized, normalized data model on its partners. The approach described above proposes to receive data as it is available, and using AI, will extract information that can be provided to the users of the service. This data will be received by the system by creating APIs. Collectively, these APIs can be thought of as comprising a "Middleware" between the partners and ConnectYXE.

Data provided to the system from the CBOs and institutional partners will be stripped at the source of any PI/PHI.

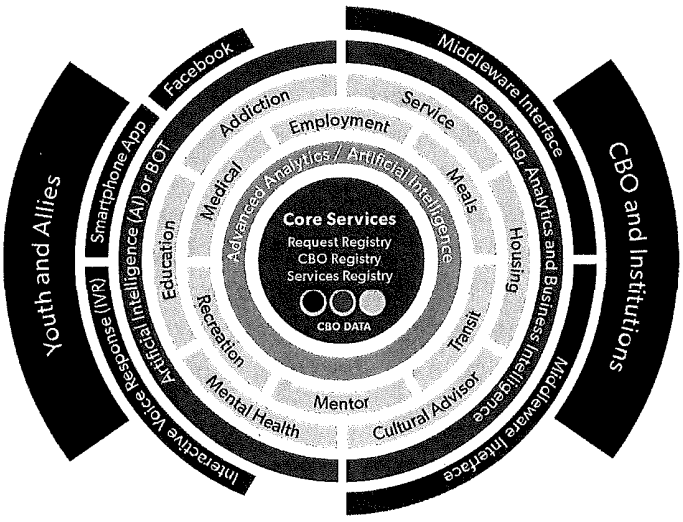


FIGURE 8: FULL FUNCTIONING CONNECTYXE SYSTEM

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ConnectYXE and 211 Saskatchewan

The Province of Saskatchewan has implemented 211 Saskatchewan "to be THE provider of real time community information and referral in Saskatchewan."

211 Saskatchewan is a free, confidential, 24/7 service that connects individuals to human services in the province by telephone, text, or web chat, plus a searchable website with over 5,000 listings of social, community, non-clinical health, and government services across the province.

This service is available by voice or text, from a phone or computer, and is available 24 hours a day, 365 days a year in 100 languages, including 17 Indigenous languages.

ConnectYXE is different from 211 in that ConnectYXE connects to the services offered by partner CBOs – in addition to connecting the individual to the CBO. ConnectYXE will collaborate with 211 Saskatchewan in three ways:

- ConnectYXE will connect to 211 Saskatchewan, facilitating an additional means of access to this service;
- 211 Saskatchewan data will be connected to ConnectYXE so that it is accessible by the analytical and AI tools of the ISM Data Lab. This will provide a rich source of data to match requests for services with ConnectYXE user's requests; and
- 211 Saskatchewan will be onboarded as a partner CBO, providing 211 with access to the services offered by constituent ConnectYXE CBOs.

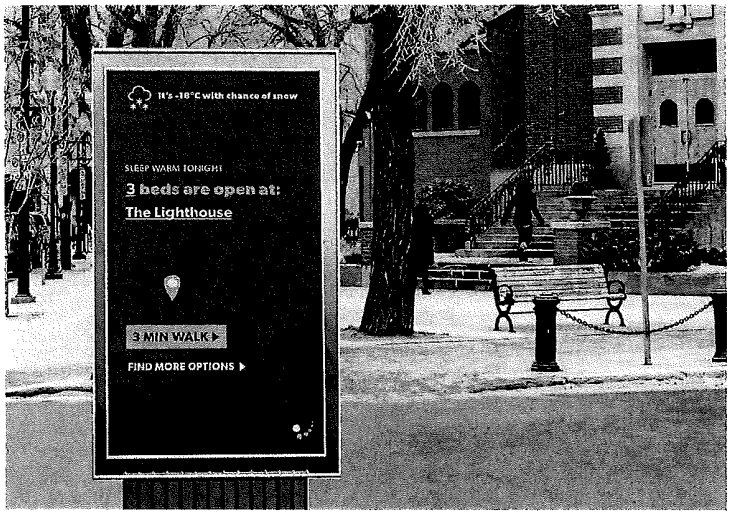
3.1.8 Public Access Kiosks

Public kiosks will be strategically placed throughout Saskatoon where Indigenous youth meet and congregate. These will present information about programs, services and transit information.

The potential for public kiosks beyond the ConnectYXE program is significant. They can be integrated with current events to promote tourism, and to advise of public services. These would provide the justification for an independent sustainable organization to advance the number of public kiosks beyond what would be funded by the program. We will monitor the use of the initially-provided kiosks as input for a business case to leverage public funding to extend this service.

3.1.9 Internet Exchange

CIRA (Canadian Internet Registration Authority) is a non-profit organization that manages all .CA domains in Canada. One of the goals of CIRA is to keep internet traffic within Canadian borders. The City of Saskatoon is a member of the Saskatoon Internet Exchange. The goal is to ensure all communications (internet traffic) between CBOs and ConnectYXE is within Canada. Combined with all data residing in Canada, we have an opportunity to keep all interactions in Canada.



SAMPLE OF CONNECTYXE PUBLIC ACCESS KIOSK

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3.1.10 Free Wireless Internet to Strategic Locations

Another aspect to improving access to ConnectYXE is to enhance the opportunities for connecting to the Internet in locations where Indigenous youth and their families are likely to be. We know that Wi-Fi access is a limiting factor for many youth who have access to a smart phone, but cannot afford monthly data plans. Current practice is for these youth to hang around schools after hours where they can get a Wi-Fi signal.

Providing broad public Wi-Fi access throughout Saskatoon is beyond the scope of the ConnectYXE program. The ConnectYXE program will improve Internet access by placing wireless access points in neighbourhoods that we identify as having a high concentration of Indigenous families, combined with socioeconomic indicators that indicate high rates of poverty. Using the Stats Canada data overlaid with Geospatial data we have determined where Indigenous families with the lowest income are located. The map shown here illustrates this approach. We will install Wi-Fi Access Points (WAPs) on light standards in one of these neighbourhoods and then use results of utilization of this service to build a business case to secure funding to extend it to additional neighbourhoods.



FIGURE 9: WI-FI ACCESS POINTS IN CORE NEIGHBOURHOODS

3.2 Storage and Application Infrastructure

Access to ConnectYXE is required 24/7, comparable to emergency services. We will leverage Microsoft's Cloud solutions to host the environment required for ConnectYXE. This solution keeps all aspects of the solution within Canadian borders and allows ConnectYXE to be scalable across Canada. Microsoft's Cloud solution includes disaster recovery, backup/restore, archiving, auditing and redundant Internet services. With a high level of redundancy, this will ensure that ConnectYXE users will have a consistent experience.

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3.3 Getting Connected to ConnectYXE

ConnectYXE will be valuable to youth, families and allies only if they have the devices to access the system, and if there is an internet connection available. ConnectYXE will address this by increasing the points of access to the system. ConnectYXE will:

1. Provide enhanced access to free Wi-Fi,

2. Place kiosks strategically throughout the city,

3. Be promoted on existing computers in schools and libraries,

4. By text or by voice using an individual's own device, and

5. (In the future) provide free Wi-Fi on public transit

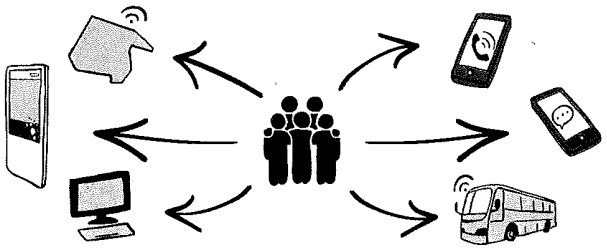


FIGURE 10: CONNECTING TO CONNECTYXE

3.4 IT Governance

IT Governance fits within the context of the overall Program Governance. In the governance model proposed, the execution of the program will reside with a Program Team, led by a Program Director. That team will deliver projects as directed by the ConnectYXE Council (documented in Section 6) and will provide IT Operations support (see Section 4.7 "Transition to Operations").

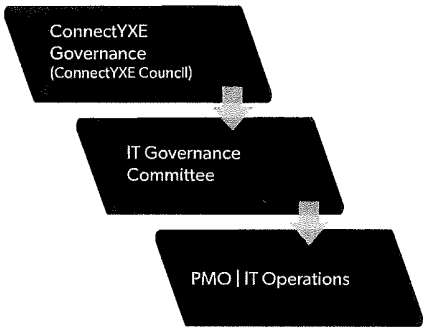


FIGURE 11: IT GOVERNANCE

The system delivered by ConnectYXE requires IT Governance to ensure the IT operation is compliant with legislation, regulations and privacy. IT Operations will be responsible for Data Governance, including data retention and disaster recovery. IT Operations is responsible for ongoing financial accountability, preparing ongoing operating budgets and applying accounting regulations to costs and expenditures.

The IT Department of the sponsoring organization – the City of Saskatoon – employs an ITIL-based Governance framework and uses IT Service Management. The City has offered an instance of the ITSM service as an in-kind contribution to ConnectYXE.

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3.5 Technical Onboarding of CBOs and Providers

There are two dimensions to the onboarding of a CBO or of an institutional partner: one is the onboarding of the partner at an organizational or partnership level. This is a product of engagement and is managed by ConnectYXE Program Governance. The second dimension is to establish a project to onboard the partner at a technical level.

CBOs can be broken into three broad categories:

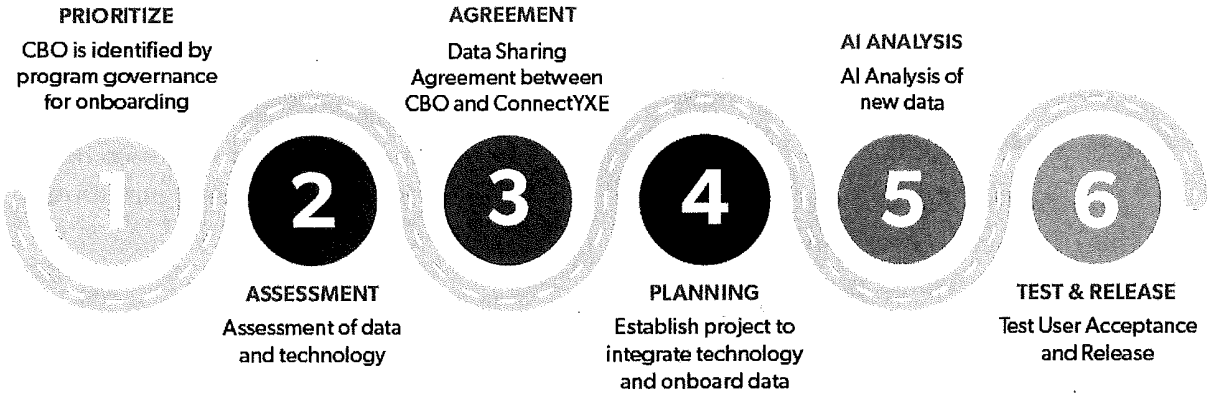
- **"No Tech"** organizations present different challenges. These are CBOs who do not have data in a form that can be shared. For these, the onboarding process will work with the CBO to establish basic administration of the services offered. Some funding will be allocated to this purpose. For these CBOs, our agreement will include supporting them to establish IT systems as appropriate. Once systems are developed, these CBOs may then be integrated into the ConnectYXE system.

- **"Low Tech"**: These are CBOs who have basic IT technology. For example, they may manage their services using spreadsheets or a local database. Data from these CBOs may be integrated into ConnectYXE.

- **"High Tech"**: Institutional partners have well-developed IT infrastructure in place and can be considered "High Tech". For example, Saskatoon Transit, City of Saskatoon Recreation and Community Development, Saskatoon Public Schools and Greater Saskatoon Catholic Schools have existing mature systems with which we can build interconnections. CBOs that use HIFIS are also "High Tech."

The roadmap provided below will vary depending on the CBO and their level of technological maturity, but will generally follow this roadmap:

Community-Based Organizations Onboarding Roadmap



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1. Prioritize: ConnectYXE program governance will identify that a CBO is a candidate for onboarding. This process is managed by the Portfolio Management Process discussed in Section 4.6 "Program Governance."

2. Assessment: We will complete a detailed assessment of the CBO's technological maturity and of their data. This will include identifying whether the CBO's data includes, or is likely to include, any PI/PHI.

3. CBO Agreement: The CBO and ConnectYXE will complete an agreement that includes a Data Sharing Agreement and a Privacy Impact Assessment.

4. Planning: The CBO and ConnectYXE will charter a project to onboard the CBO. This step completes the planning for the onboarding, complete with a project team from the CBO and ConnectYXE. Planning will include identifying the process(es) by which any PI/PHI will be removed from the data sent to ConnectYXE.

5. AI Analytics to Extract Services: Once CBO data has been onboarded and resides in a secure partition, the AI Toolkit of the ISM Data Lab will begin to extract meaning from it – which will populate the services that end users will access.

AI Analytics to Provide Insights: This same ISM Data Lab will, once it has a sufficiently large set of data, analyze the aggregated data, producing trends, deeper analysis and insights.

6. Testing and Release: Once the new data has been tested by the CBO and other User Acceptance Testers, the data will be made available to the youth, families and allies of ConnectYXE.

3.5.1 Integration with CBOs and Institutional Partners

ConnectYXE does not replace nor compete with applications delivered or being developed by other partner organizations. ConnectYXE will connect users to other partner applications. Here are a few examples:

CBO/Institutional Partners	Technology Integration
211 Saskatchewan	211 Saskatchewan (S211) maintains a database that connects individuals with over 5000 agencies and social services. It provides access to this list of services 24 hours a day, every day, by voice (dial 211), text (text to 211), or as a web chat. This database has a published API with which ConnectYXE will directly connect. As discussed, partnering with S211 provides a "safety net" such that users who cannot otherwise find a ConnectYXE service can connect – in real time – with S211. ConnectYXE.can be configured to seamlessly connect to 211 Saskatchewan – either text or voice.
HIFIS	The Homeless Individuals and Families Information System (HIFIS) is a federal government system, providing real-time information about emergency shelter and food services. This system as a published API with which we can integrate ConnectYXE.
Central Urban Metis Federation Inc.	CUMFI uses HIFIS and is moving to HIFIS 4.0 for all of their locations. There is an opportunity for ConnectYXE to expand other services that CUMFI offers, an example is laundry.
EGADZ	EGADZ maintains a SQL database stored on servers at Innovation Place. They currently have an interface used by outreach workers that provides ConnectYXE an integration opportunity. Integrating with EGADZ, we can tap into services that it provides – for example, the "I am not for sale", or the "runaway" apps.

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Saskatoon Transit	Saskatoon Transit is a major institutional partner. Through the API to their TRAPEZE system, we can provide real-time transit information. Through ConnectYXE, we can connect to, and use "Trip Planner". Of particular significance, we can provide pre-paid transportation, using new functionality coming with the "Mobile Ticketing" feature.
Saskatoon Recreation and Community Development	ConnectYXE can connect to City of Saskatoon Recreation and Community Development systems, to provide real-time access to drop-in programs, longer term recreational opportunities and other services.

TABLE 5: TECHNOLOGY INTEGRATION WITH CBOS

3.5.2 Technical Collaboration Partners ISM and the Social Innovation Hub (SIH)

ISM Canada is the major technology partner in the development of the Saskatoon Smart Cities Challenge and will be the major contributor of the technical solution of ConnectYXE. The design of ConnectYXE is based on the design of the existing and successfully deployed Social Innovation Hub (SIH), as mentioned earlier. ISM Canada, in conjunction with the Government of Saskatchewan, has invested significant research and development over the past two years to create this innovative data hub in the social sector.

3.6 Scalability, Replicabiility and Future Proofing of the ConnectYXE Design

The ConnectYXE program has been developed to meet the needs of Indigenous youth in Saskatoon. However, the design is:

- **Scalable** – that is, it can be extended to meet the needs of other marginal communities in Saskatoon;
- **Replicable** – it can be applied to other cities in Saskatchewan, in Canada, and globally; and
- **Is "Future-Proof"** - it will only improve as AI tools, Natural Language Processing Tools and other technologies emerge.

3.6.1 Scalable

The proposed design can be scaled to benefit other communities than the initial target community of Indigenous youth. What tailors the system to Indigenous youth is the fact that services identified by the Youth Advisory Board are those services that will be on boarded and in the priority identified. Other related services can be added as needed.

3.6.2 Replicable: A Framework for Canada

The specific data collected by ConnectYXE will apply to Saskatoon and people moving to Saskatoon. However, the system as designed has a much broader reach. The solution is built on the ability for any service provider to be added. This framework approach allows any city in Canada to add their services.

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Part of what makes this solution replicable is that it is cloud based: it is not contingent on a locally-placed server infrastructure. This solution can be scaled upwards to meet the needs of other cities in Saskatchewan, in Canada, and globally.

3.6.3 Future Proof

AI is emerging as a technology that is bringing new capabilities and automating tasks that humans currently do. Institutions and businesses around the world are increasingly using AI for a multitude of purposes including medical diagnosis (e.g., IBM Watson), analysis of "big data" for purposes of marketing, or for stock optimization to mention only a few examples. ConnectYXE seeks to use the same technology to address a social challenge.

Future improvements to AI and to Natural Language Processing (NLP) are coming rapidly. We have seen firsthand NLP provide translation between languages. In the future, we anticipate support for local Indigenous languages

The technology incorporated in the design of ConnectYXE is best practice, available, and used in other industries today. What distinguishes ConnectYXE is what the technology is being used for, how the application will make itself available and accessible to those who will benefit from the service, and the provision of powerful and meaningful analytics delivered to stakeholders.

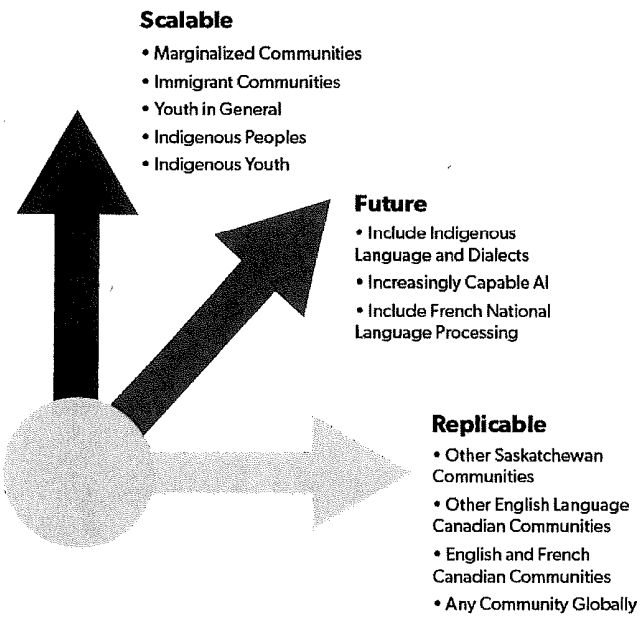


FIGURE 12: FUTURE EXPANSION OF CONNECTYXE

3.7 Risk Management

Risk Management cuts across each of the sections of this proposal, and risks frequently overlap domains. As a result, we have consolidated the risks, and the discussion of the risk log in Section 9 "Risk Management." That section shows those risks that, overall, received the highest impact profile: we have provided our current risk log in its entirety in Appendix Four: Entire Risk Log.

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TRI-COUNCIL REGION

RURAL MUNICIPALITY OF KELSEY

THE TOWN OF THE PAS

AND

OPASKWAYAK CREE NATION

MANITOBA, CANADA

SMART CITIES CHALLENGE

FINALIST PROPOSAL

MARCH 5, 2019



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EXECUTIVE SUMMARY

As finalists in the Smart Cities Challenge, the Tri-Council region in Manitoba is pleased to submit this proposal on behalf of our communities; the Rural Municipality of Kelsey, Opaskwayak Cree Nation, and the Town of The Pas. Our challenge statement is as follows:

Our community will utilize LED Smart Farm technology to support local nutritious food growth and promote food security, create a smart phone distribution system and integrate wearable technology to achieve a 40% reduction in the number of imported vegetables and a 20% reduction in community diabetes rates by 2023.

The goal of this project is to both demonstrate a decrease in diabetes incidence rates within our region, as well as create the infrastructure necessary to inexpensively scale the solution to many other communities in Northern Canada. The two major barriers that currently hinder wide-scale consumption of fresh fruits and vegetables in the Tri-Council region, as well as many other northern communities, is the cost and quality of these products. To decrease transportation costs while increasing the quality of produce, it is necessary to bring production of these goods to the local scale.

Our proposal will flow in a logical manner as outlined by the finalist guideline. In Chapter 1 we discuss our vision and our transformative approach to solving it, utilizing connected technology and innovative solutions in our approach to develop critical levers that will positively and uniquely impact our goals. Establishing these levers is the focus of our Smart Cities project.

In Chapter 2 we developed our performance measurement outcomes, creating a logic model and ensuing narrative that describes the activities required to complete our project, outcomes statements, indicators to measure the outcome statements and data source identifiers that inform indicator measurement. We have also included a payment schedule in this chapter. The content of this chapter informs the content of an outcomes-based contribution agreement.

Chapter 3 contains the elements required for successful project management including a work breakdown structure, which identifies tasks associated with completion of each activity as presented in Chapter 2. This information is also presented graphically in a Gantt chart which illustrates the project's critical path and corelates financial reporting periods and project activities. Furthermore, this chapter identifies required resources, risks, stakeholders, and considerations for long term project sustainability.

The technology that will be utilized for the success of our project is described in Chapter 4.

The first formalized governance structure of the Tri-Council will be the not for profit corporation that has been established for this project. The Board of Directors that will have equal representation from each of the three governments and the articles of incorporation are such that each of the members will have equal voice at decisions made. This has been described in Chapter 5, in which we also indicate who our partners are and their readiness to participate in this project.

In Chapter 6 we discuss our engagement strategy and tools used for gathering the thoughts and ideas from our community members. The population of our communities and our long-established history of living

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together has allowed us to create pathways of communication that supported the development of this proposal and will allow us to continue to receive the feedback we need to ensure that we are aware of and addressing the needs of our community members as we proceed with the project.

Chapter 7 is an overview of the initial steps we have taken to understand the legislative authorities that guide all aspects of our project that are associated with personal information or personal health information. Because we have both provincial and federally regulated entities within out partnership, we have both provincial and federal authorities to consider when implementing our project. We have completed preliminary impact assessments with both and will complete more comprehensive assessments upon implementation.

Our financial plan is detailed in Chapter 8 and corresponds to the performance measurement outcomes and project management requirements that were detailed earlier in the proposal.

Chapter 9 identifies our plans for meeting policy requirements pertaining to Duty to Consult with Indigenous groups, modern treaty obligations and community employment benefits required under the Investing in Canada plan.

Beyond the benefits to our own community, we recognize the potential of our project to be adaptable and scalable to any community in Canada. We trust that our contribution to addressing food sovereignty in our own community, similarly, contributes to the national food security issue. We also trust that our innovative approach to addressing diabetes will be widely used across Canada as we know that too many of our fellow citizens suffer with the same affliction.

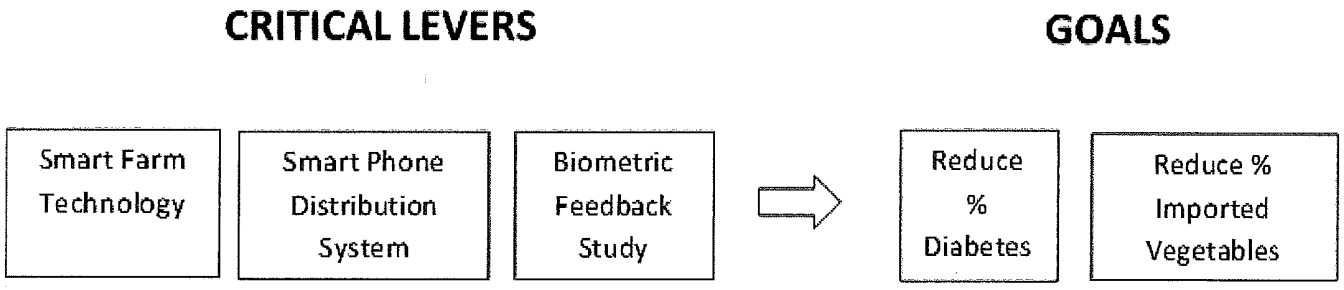
We recognize that our efforts in developing this proposal have created new synergies among our communities and welcome the opportunity to build upon these in the future.

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1 CHAPTER 1: VISION

The Smart Cities journey for the Tri-council communities began by identifying that good health is a priority for our community members. Diabetes is the single greatest health issue in our region and so decreasing diabetes rates was identified as a goal that could be achieved through a Smart Cities approach. Further, we understand the link between healthy, nutritious food and combating diabetes. Our definition of nutritious food means food that is grown, is fresh, does not contain harmful chemicals or pesticides and is not preserved or modified. Food security means that this nutritious food must be accessible and affordable; not impacted by factors such as weather, distance, fuel costs and international trade. Accessibility and affordability have been an ongoing issue for our remote geographical location, as it is to many Canadians. During the process of engaging stakeholders, we identified our goals as a 40% reduction in the number of imported vegetables and a 20% reduction in community diabetes rates. Further, we created a list of critical levers that could be developed to achieve these identified goals. Establishing these levers, as listed below, is the focus of our Smart Cities project.

- Utilize Smart Farm Technology to facilitate year-round local food growth
- Create a smart phone enabled distribution system, leveraging electric vehicles for low cost operation, and
- Integrate wearable continuous glucose monitoring (CGM) device technology to cultivate community knowledge and demonstrate the impact of healthy food on physical biometrics



Our approach is transformative, utilizing connected technology and innovative solutions in our approach to develop critical levers that will positively and uniquely impact our goals.

1.1 Critical Levers

1.1.1 Smart Farm

The Smart Farm Technology, known in the community as the Smart Farm, is a technology that addresses many of the factors currently impacting our accessibility to healthy fruits and vegetables. This technology allows us to have year-round product availability with output that can readily be expanded to meet demand. With a three-week growth cycle, the technology allows for nimble response to demand and alternate growing cycles for product reliability. As this growth is indoors, it is climate agnostic and

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geography independent: food can be grown in this manner in the tundra, above the tree line, on bedrock or anywhere that people find themselves living in an environment that does not lend itself to outdoor gardening. This technology is also environmentally friendly, reducing the need for transportation of our food from the southern states, reducing refrigeration costs, and reducing land and water resources. Additionally, we create employment for our own community members to grow our food rather than paying people we will never see to do this for us. Using this technology, we obtain food sovereignty – a right that we choose as important to us.

The Smart Farm Technology is a critical lever to the success of our outcomes for these reasons:

- Enables local year-round food growth
  - Freshness of food and the impact of fresh food on diabetes
  - High food cost and early food spoilage are associated with long transport routes which can be mitigated through local food growth
  - Year-round local food growth necessitates indoor production due to harsh climate
  - Existing Korean technology is a preferred option because of their proven production rates and a previously established collaborative relationship on technology, research, and learning from their advancements.

The transformative impact to the community has a broad reach. Fresh, affordable, accessible food has not e everyday life of most community members for decades. However, the transformation at. This technology allows community members to raise food for their families, neighbours well as create jobs within the community.

Very replicable

n technology is both scalable and replicable in any community, regardless of size, as it can be pace as small as a shipping container or as large as an airplane hangar. The input or operation of Smart Farm technology include water, electricity, heat, nutrients, and seeds.

Phone Distribution System

The smart phone distribution system consists of two parts. One Is the **smart phone application** (app), which serves as an online marketplace, and the other is the physical distribution of food, utilizing an **electric vehicle distribution** system, that is dispatched through the smart phone app.

The smart phone app provides community members with a means to connect to the distribution system by providing an interface to access to goods. The app will resemble any other online marketplace, providing customers with information such as product availability, price, a purchasing platform, and incentives. The [redacted] complementary second function which provides knowledge and support for the use of n by providing information such as recipes and nutritional information. Additionally, a indicating times and locations of local community cooking classes or food sharing ll also be available. Popular lunch and learn sessions on issues pertaining to health and e advertised in this manner. Options for payment will include use of popular credit cards and its to a user's account.

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Through extensive community engagement, we have determined that direct to door distribut increase the possibility that community members will begin to consume more healthy food. an identified barrier to accessibility is that many community members do not have access to small children to care for, or are unable to get to the grocery store in a timely manner. In ord operating costs as low as possible, physical distribution of food will be done through the utili electric vehicles; an order generated through the smart phone app triggers dispatch of the de

Our decision to use electric vehicles has been encouraged by the clear signal from automakers and government policies that electric vehicles are here to stay and the way of the future. As a Tri-council, we know that a smart cities approach is to look to the future and to consider how we can leverage resources for more than one purpose. As such, we look to the potential of tying into the growing provincial infrastructure of electric vehicles, as outlined in Manitoba's Electric Vehicle Roadmap document, offering our community members the infrastructure support required to operate electric vehicles within the region.

As it pertains to our goals, we considered how the use of electric cars could ensure adopting healthy food choices in the daily lives of our citizens. Our considerations focus on the reality that our electricity rates are the lowest in North America and that this is a cheaper source of energy than the imported liquid fuel we currently rely on. Using electric vehicles, we can reduce operating costs and, in this way, pass the savings on to the customer thereby eliminating one of the identified barriers to healthy eating: astronomical costs for low quality produce.

The Smart Phone Distribution System is a critical lever to the success of our goals because it increases the distribution system's capacity and efficiency. Most community members utilize their smart phone to communicate with each other and their broader social networks, so it is anticipated that this approach will be effective in connecting customers with the products they want.

Although electric vehicles have been chosen as the vehicle platform for the project, the distribution system can utilize any form of transportation, coupled with the smartphone platform, to functionally accomplish distribution. For example, delivery can be made by foot, bicycle, canoe, drone, or even conventional vehicles. Furthermore, the use of smartphone technology is convenient for reaching larger populations, however, in smaller communities, or communities without reliable access to wireless internet, product selection and ordering could be accomplished through alternative means.

1.1.3 Biometric Feedback Study

Wearable CGM devices, used to measure blood glucose levels in real time, will be worn by a **voluntary study group** as part of an academically led research project that will link the impact of healthy eating on physical biometrics including blood glucose. Furthermore, we see this group as creating the beginnings of a critical mass of community members who recognize the impact of healthy eating and, with this knowledge, influence change for the entire community. A study group provides a quantifiable metric for the impact of our project, allowing us to evaluate the effectiveness of dietary choices on human health; particularly the onset of diabetes. The study group will be guided and supported by health professionals at one of our two

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local primary care centers. Nurses will input biometric data from the participants into the electronic medical record (EMR) system. In this way, the data of the participant will be confidential, and allow for simplified feedback over time as the EMR generates graphs and reports that participants can observe. This feedback has proven to be a useful tool to incentivize and encourage individuals in their health journey. Participants will also have professionals to assist them with any health concerns including mental wellness support, group counselling support, or other medical needs.

Throughout this research project, we will support Individuals from all of our communities who wish to participate. One of the Tri-Council members, Opaskwayak Cree Nation (OCN), has adopted an integrated care team (ICT) model of care based on the Alaskan South-Central NUKA model of care. The ICT is nurse led and supported by a physician and/or nurse practitioner, a social worker and clinical assistants. The team is further supported by learning circles which support groups of community members that are facing similar issues to meet and support each other. The seven sacred teachings have been incorporated into all programming at OCN's Beatrice Wilson Health Centre, which offers traditional and non-traditional spiritual care to support the choice of the individual. Our non-First Nation partners also utilize the knowledge of Beatrice Wilson Health Centre staff for Indigenous Cultural training for their non-Indigenous health staff. Through our collaborative Statement of Intent, discussed later, the provincial Northern Health Region and OCN have agreed to share health resources and work together to learn how to best meet the needs of

[redacted]embers who seek health care in any of our local health facilities, including the local hospital.

feedback study is a critical lever to the success of our outcomes for these reasons:

ne biometric readings provide a strong feedback mechanism corelating dietary decisions and ugar levels, thus cultivating participant and community knowledge of the importance of a / diet

ng a powerful data collection mechanism for academic analysis and healthcare best practice dge

The value of the wearable CGM device is in its use for real-time blood sugar monitoring to facilitate personal health knowledge acquisition. However, real-time monitoring is not critical in gaining this knowledge; conventional point measurement approaches to blood sugar monitoring, although less powerful in providing feedback, also serves the purpose of providing feedback on dietary choices.

1.2 Goals

We will measure our goals utilizing a variety of data collection methods.

1.2.1 Reduction in diabetes rates

Although we have been aware that the lives of many of our community members are impacted by diabetes, it is through the collection of data that we have been able to quantify this. Every five years, the Northern Health Region, under the direction of the provincial government, completes a community health needs assessment that captures many of the health issues, health care utilization rates, morbidity and mortality rates and other factors that measure the overall health care needs of the population. While some of the

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data of the population of Opaskwayak Cree Nation is captured in this assessment, it is only as it pertains to such factors as hospitalization, cancer care and dialysis usage. To capture the data for the entire Tri-Council region in a uniform manner, OCN utilized the same data collection methodology and reporting structure to complete a community health needs assessment for OCN that can be directly compared to the provincial data. In this way, we have managed to complete an overall picture for the region and this data serves as a baseline that can be utilized as a comparator for future assessments. Given that this is recent data, we will complete community health needs assessments in a similar manner in five years and ensure t' evaluating the impact of our project on diabetes rates in the region.

[redacted]

Good baseline -

The data for residents of The Pas and RM of Kelsey, as captured in the provincial Northern He (NHR) 2016 aggregated data, indicates that in Manitoba 28.1% of the population was recorde from diabetes and prediabetes with a projected rate of 31.3% by 2026.

Data for Opaskwayak Cree Nation was collected in the identical manner as the NHR, utilizing t epidemiologist so that data could be compared and aggregated geographically rather than jur In 2017, 46% of those living in OCN had been diagnosed with diabetes according to OCN's Cor Health need's assessment report. In 2017, two primary care physicians began practicing at Beatrice Wilson Health Centre. In February 2019, data from the medical records indicate that 60% of their patient population of 1800 people have Type 2 diabetes. The increase of 14% over two years could indicate that community members are now receiving better primary care so previously undiagnosed individuals are now diagnosed and are receiving treatment.

The high rates of diabetes in the Tri-Council region and the monetary and human costs associated with the disease has resulted in the citizens and leadership of the region to determine that real solutions to the escalating problem need to be developed and has therefore become a priority in planning. This was confirmed through our community engagement process detailed in Chapter 6.

The primary care clinics in both The Pas and Opaskwayak utilize the same electronic medical record and patient records can be accessed from either clinic. This data sharing has been secured through a privacy impact agreement signed by leadership in both communities. The patient data in the electronic medical record can be anonymized and collated into reports that assist us in evaluating diabetes rates and reductions in diabetes indicators such as blood glucose levels, Hemoglobin A1C levels, and other biometric measurements. The consistency of data resulting from this shared electronic medical record is an evaluation tool that is useful for us to look at regional population health as we evaluate the impact of our project on the health of our community members.

1.2.2 Reduced in % of Imported Vegetables

In the initial months of our implementation phase, we will monitor current fruit and vegetable import rates into the community. This will serve as our baseline measurement against which we will monitor the success of our project over time. As reflected in the responses from businesses and community members in our community engagement strategies detailed in Chapter 6, we anticipate that fruit and vegetable

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consumption rates will increase, particularly as it pertains to the utilization of local food, given that our project will be addressing the two main barriers to fresh fruit and vegetable consumption: cost and quality.

Current fruit and vegetable import rates can be measured by:

- Communication with existing distributors
- Partnership with existing grocery stores

Accurate assessments of import reduction can be done by comparing baseline data to the ratio of locally produced to imported produce at the end of the project. These two factors provide us with an overall accurate reflection of percentage of food import and community utilization over time.

1.3 Progress towards outcomes during the finalist phase

During the finalist phase we have made the following progress towards outcomes:

- Increased community awareness of the project
- Solidified the vision with the Tri-Council
- Steps towards localizing consumables required for growing food
- Development of requirements document for software
- Laid foundations for a biometric study with the University of Manitoba
- Identified partners for our project
- Identified suppliers for all materials
- Secured real estate and preliminary designs for the smart farm
- Establishment of a governance model for the project

1.4 Reasons to be selected as winner

Our project is unique in many respects and aligns with the Smart Cities Challenge guidelines as well as other priorities for Canadians. These include:

- Tri-Council governance model – a unique model that includes Opaskwayak Cree Nation, The Town of the Pas, and the Rural Municipality of Kelsey
- Scalable and adaptable to any community in Canada – food production can adapt to population size and consumption rates and can be established within existing infrastructure; deployment of food can be adapted using a range of deployment methods
- Local food sovereignty – communities can grow food according to community preferences and scaled to meet community consumption rates
- National Food Security – reduced reliance on imported goods
- Carbon Reduction – decreased transport energy consumption
- Health care costs – reduction in hospitalizations, amputations for diabetics
- Community job creation – more northern/local employment opportunities

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- Northern development – vendor agnostic modular approach
- First Nation partnership – enhanced community independence
- Multi-jurisdictional health partnerships – reduction in service delivery gaps caused by jurisdictional issues

Our project is transformative in that we are using connected technology to facilitate the grow connect community members with that source of food as well as utilizing wearable technolog insight into the correlation between dietary choices and health outcomes.

Throughout this project, we have considered and prioritized a design that is both scalable, to future expansion as well as easily replicable in other regions of Canada to accommodate local resources and existing infrastructure.

transformative model

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2 CHAPTER 2: PERFORMANCE MEASUREMENT

2.1 Project Activities and Outcomes

The overarching philosophy of this project is that increasing access to fresh fruits and vegetables, as well as promoting knowledge of the correlation between dietary choices and diabetes, is the pathway to achieving the community identified goals of decreasing diabetes rates and decreasing imported food rates. Community feedback through surveys, interviews, and conversations clearly indicates that fresh fruit and vegetables are currently inaccessible due to either excessive costs, low quality, or absence from grocery store shelves. Therefore, the activities necessary to increase access to fresh fruits and vegetables have been identified as building and operating the three critical levers introduced in Chapter 1; a Smart Farm, smartphone distribution system, and biometric feedback study. Ongoing community engagement, as described in Chapter 6, is necessary to ensure operation of these tools is efficiently and effectively achieving the desired outcomes.

The first lever that will be developed is the Smart Farm. The function of the Smart Farm is to enable, using indoor food growth technology, the year-round localization of economical fruit and vegetable production. Localization of production of these foods mitigates the transportation time and cost from the current procurement model, which are identified as key drivers of cost and early spoilage (products are 1-2 weeks old by the time they reach shelves).

The second lever that will be developed is a smartphone distribution system. The smartphone distribution system is comprised of both a smartphone application software component as well as a vehicle-based delivery service component. The function of the smartphone software application is twofold. The first function is to provide an online marketplace to enable selection of desired products, facilitate purchase, and dispatch packaging and delivery activities. The second function is to provide recipe ideas and cooking guides on community recommended applications for food products as well as community cooking events. The function of the vehicle-based delivery service is to provide direct-to-door delivery of food products so that additional barriers to accessing grocery stores, such as not owning a vehicle or having young children to care for, are overcome.

The third lever that will be developed is a biometric feedback study. This study involves the use of real-time blood sugar monitoring technology to provide feedback, to the study participant who is wearing the device, on the correlation between dietary choices and diabetes. The participant may also share this information with their primary care provider for health management support. This feedback is expected to enhance awareness of the link between diet and diabetes in the study participants, and in turn, enhance community awareness of this link. Furthermore, by partnering with the University of Manitoba, publication of the study results can further assist in enhancing awareness throughout the community.

2.2 Project Implementation: timelines, deliverables, milestones

The implementation phase of our project is constructed to have four milestones over five years. Within these four milestones, we have a list of project activities. These activities centre on the three critical levers discussed above. The implementation process for this project takes each of these three critical levers and

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divides them into two stages of development: **building** and **operating**. As such, our implementation activities, outcomes and indicators capture the two stages of each of the levers: **building** of these critical levers and **operation** of the critical levers. The milestones and activities are depicted on the logic model below. They are further discussed from a project management perspective in Chapter 3 and illustrated in chronological order on the accompanying Gantt in that chapter.

2.3 Logic Model Overview

The logic model, shown in Figure 1, provides a summary overview of the activities and outcomes associated with the project. A more detailed logic model, including indicators, milestones and data sources is shown in Figure 2 on the next page. A legend, identifying the information that is conveyed on the detailed logic model is shown in Figure 3.

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Table 1 includes a list of outcome indicator data sources and the data source number that is used in Figure 3.

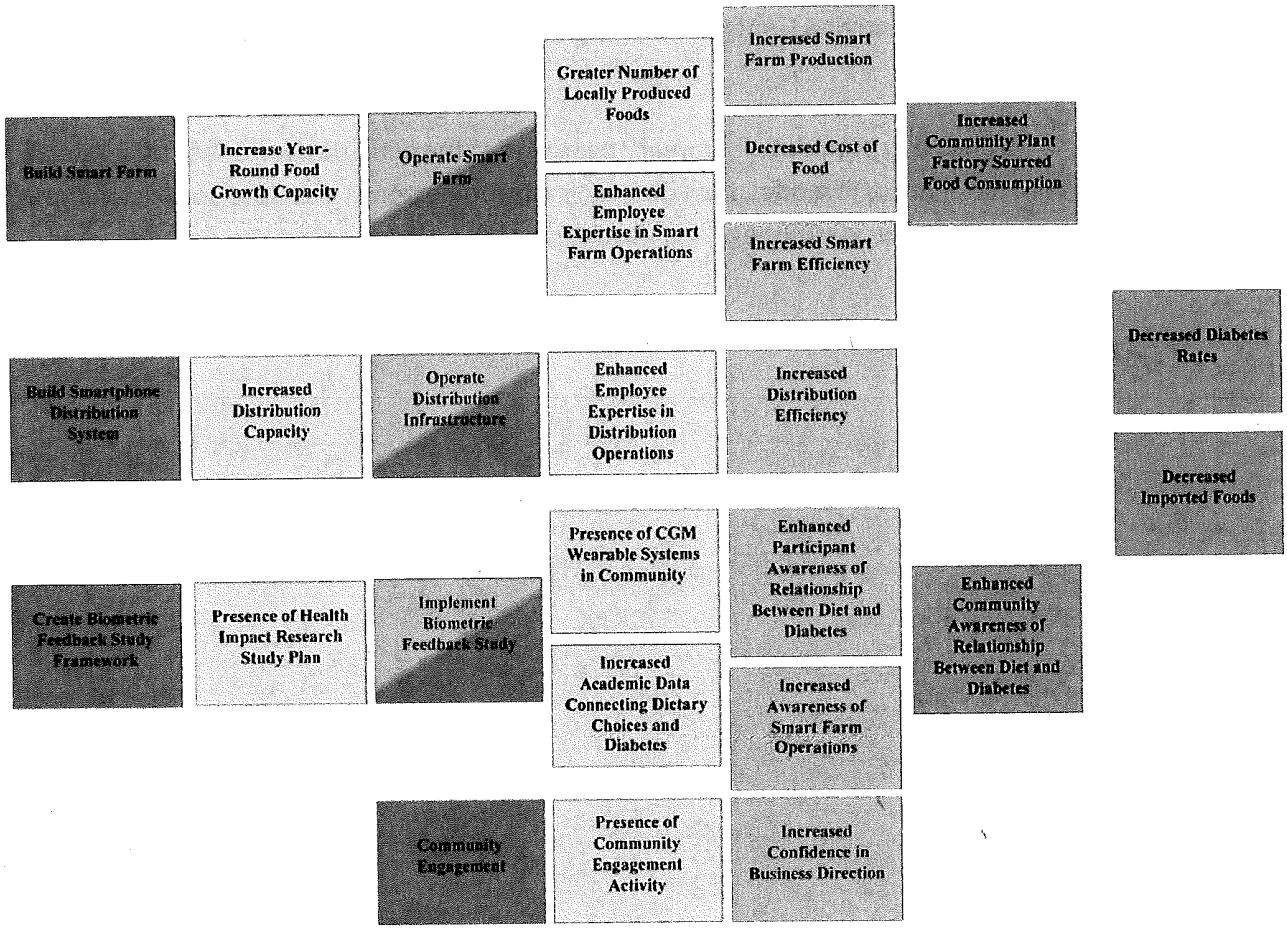


Figure 1 summary logic model

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Figure 2 detailed logic model

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Table 1 summary of performance indicator data sources

DATA SOURCE #	INDICATOR DATA SOURCE
1	Smart Farm operational data
2	Smartphone distribution system operational data
3	Community engagement activities (described in Chapter 6)
4	Study participant group data
5	Knowledge translation partners

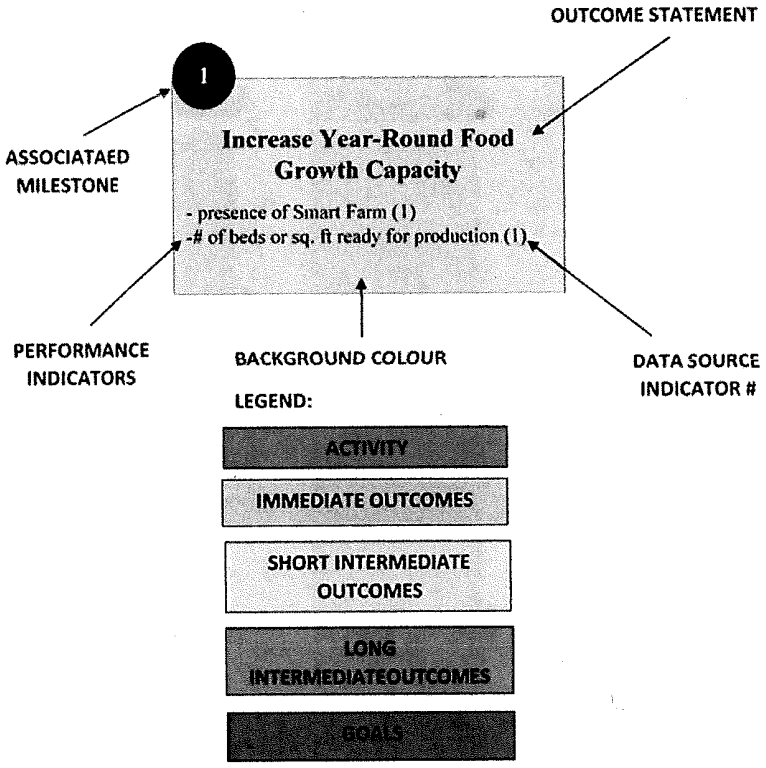


Figure 3 detailed logic model legend

2.3.1 Description Of Detailed Logic Model

MILESTONE 1:

The activities associated with achievement of MILESTONE 1 will involve:

- **Build** the Smart Farm
- **Build** the smartphone distribution system
- **Build**, or create, the biometric feedback study framework.

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This phase is anticipated to take roughly 21 months as outlined in the Gantt chart.

Outcomes associated with MILESTONE 1, bulleted below, with sub-bulleted indicators, and indicator data source number as per the table above (in parenthesis), include:

- Increase year-round food growth capacity
  - Presence of year-round food growth facility (1)
  - # of beds or sq. ft ready for production (1)
- Increased distribution capacity
  - Presence of a software integrated order system (2)
  - Presence of a software integrated packaging system (2)
  - Presence of a software integrated delivery distribution system (2)
- Presence of a health impact research study design
  - Timeliness of: (4)
    - Approvals
    - Partnership agreements
    - Participant consent forms
    - Study schedule
    - Participant selection criteria
    - Outcome measurements

MILESTONE 2:

The activities associated with achievement of MILESTONE 2 will involve:

- Initiate **Operating** the Smart Farm
- Initiate **Operating** the distribution infrastructure system
- **Perform** Community Engagement activities

It is anticipated that achieving this level of operational maturity will take approximately 9 months, and with the inclusion of a 3-month allowance time for milestone report and review, this milestone is achieved at roughly month 33 of project implementation.

Outcomes associated with MILESTONE 2, with sub-bulleted indicators, and indicator data source number as per the table above (in parenthesis), include:

- Greater number of locally produced foods
  - # of market ready products per harvest (1)
  - # of different product options (1)
- Enhanced employee expertise in Smart Farm operations
  - # of employees with completion of training certificate (1)
  - # of employees with return of demonstration of acquired skills (1)
- Enhanced employee expertise in Smart Farm distribution operations
  - # of employees with completion of training certificate (1)

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- Presence of community engagement activities
    - # of engagement processes utilized (3)
    - # of campaigns deployed (3)
    - Amount of donated produce to schools, businesses and care homes (1,2,3)

MILESTONE 3:

The activities associated with achievement of MILESTONE 3 will involve:

- Optimize **Operation** of the Smart Farm
- Optimize **Operation** of the smartphone distribution system
- Implementing (**operating**) the biometric feedback study
- Perform Community Engagement Activities

The primary outcome for achievement of MILESTONE 3 is the implementation of the biometric feedback study. Implementation of the study as well as synthesis of the produced data and creation of a final report is expected to take 18 months, with completion occurring at roughly month 51 of the project implementation. We are also continuing to increase production at the Smart Farm during the implementation of the biometric feedback study.

Outcomes associated with MILESTONE 3, with sub-bulleted indicators, and indicator data source number as per the table above (in parenthesis), include:

- Increased Smart Farm production
    - % increase in active grow beds (1)
    - % increase in species grown (1)
    - % increase in market ready products per harvest (1)
- Decreased cost of food
    - % reduction in cost of food produced (1)
- Increased Smart Farm Efficiency
    - % reduction in unsold produce (1)
    - % reduction of spoiled product (1)
    - % reduction in amount of energy input to Smart Farm per active bed (1)
- Increased distribution efficiency
    - Presence of software driven dispatch (2)
    - % increase in orders delivered within scheduled time block (2)
- Presence of CGM wearable systems
    - # of study participants (4)
    - # of CGM wearable systems deployed (4)
- Increased presence of academically verified data connecting dietary choices and diabetes
    - Presence of academic paper (4,5)
- Enhanced participant awareness of the relationship between diet and diabetes
    - % of participants who feel better informed (4)

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- % of health professionals who report increased study participant awareness (4,5)

- Increased awareness of Smart Farm operations
  - # of participants responding to surveys (3)
  - # of participants attending focus groups (3)
  - # of participants engaging in forums (3)
  - % increase in overall community satisfaction (3)
- Increased community plant factory sourced food consumption
  - % increase in orders (2)
  - Increase in reported consumption (3)
- Enhanced community awareness of relationship between diet and diabetes
  - # of community forums sharing results of study (3)
  - % of community engagement survey responses indicating enhanced awareness (3)
- Increased confidence in business direction
  - % of elders supporting business activities (3)
  - % of community members with high degree of overall satisfaction (3)
  - % of government leadership supporting business activities (3)

MILESTONE 4:

The activities associated with achievement of MILESTONE 4 will involve:

- Collaborate with knowledge translation partners in producing reports on outcome/goal achievement indicators
- Optimize operation of the Smart Farm
- Optimize operation of the smartphone distribution system
- Perform Community Engagement activities

Working with our knowledge translation partners, the Northern Health Region, Opaskwayak Health Authority and the University of Manitoba on identified aspects of creating the final report, our expected timeline of these activities is 6 months, with expected completion occurring in five years (60 months).

Outcomes associated with MILESTONE 4, with sub-bulleted indicators, and indicator data source number as per the table above (in parenthesis), include:

- Decrease in diabetes rate
  - # of occurrences reported in community health needs assessment (3,5)
  - % decrease in occurrences reported through EMR anonymized data (3,5)
  - % decrease in biometric indicators among research study participants (4,5)
- Decrease in imported food
  - % decrease imported produce, as reported by grocery store surveys (3)
  - Ratio of operating cost to sales revenue (1,2)

This final milestone will include completion of the final report which will include information from three different sources to evaluate the impact of our project on diabetes rates in the Tri-Council region. Theses

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sources include the NHR and OCN Community Health Needs Assessment reports with a comparison of diabetes rates benchmarked in 2017/18 to those in 2024, anonymized data from the EMR, and the results of the research study. Furthermore, a comparison of benchmarked community food import quantities from 2018 will be compared against those values in 2024 to determine the percent change in imported foods. Optimization of the smart farm and smartphone distribution system is anticipated to have reached a level of economic self-sustainability, where revenue from produce sold exceeds the operating costs and profits can be redirected to further improve the health of community members.

Payment Schedule and performance indicators

Achievement of each project milestone, identified above, will be associated with financial resource release from the project's funding partner, Infrastructure Canada. The milestones are again listed in Table 2 below along with reporting project outcomes used to identify achievement of the milestones.

Table 2 Payment Schedule

Project Milestone	Installment ($)	Project Outcomes Reporting Schedule
Initial	6.22 million	
1	1.11 million	➢ Increase year-round food growth capacity ➢ Increased distribution capacity ➢ Presence of a health impact research study design
2	2.41 million	➢ Greater number of locally produced foods ➢ Enhanced employee expertise in Smart Farm operations ➢ Enhanced employee expertise in distribution operations ➢ Presence of Community Engagement activity
3	0.26 million	➢ Presence of CGM wearable systems ➢ Increased academic data connecting dietary choices and diabetes ➢ Increased Smart Farm production ➢ Decreased cost of food ➢ Increased Smart Farm efficiency ➢ Increased distribution efficiency ➢ Enhanced participant awareness of the relationship between diet and diabetes ➢ Increased awareness of Smart Farm operations ➢ Increased confidence in business direction ➢ Increased plant factory sourced food consumption ➢ Enhanced community awareness between diet and diabetes
4		➢ Decrease in diabetes rate ➢ Decrease in imported food

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2.4 Risk Identification and Mitigation

One of the main risks associated with any strategy for impacting health outcomes is that the ownness for action lies with the individual. The three-lever approach presented in this project is designed to efficiently remove as many barriers as possible between community members and fresh fruits and vegetables with the goal of decreasing diabetes rates and decreasing imported foods. However, the assumption then is that each of the three levers are operational. Therefore, risk mitigation must extend into operation of each of the three levers. These risks are identified and presented with mitigation strategies in Chapter 1.

The Smart Farm, just like any other farm, has inherent risks such as pests or farmer error such as inappropriate nutrient supply or premature/late harvest. There is likely to be a learning curve that, throughout the first year or so of operation, results in some degree of crop failure. Mitigating measures include partnership with the OCN pilot Smart Farm in order to acquire as much knowledge from local experts as possible, thereby increasing the probability of success. Furthermore, segregation of vertical farming beds into quarantine or containment rooms to minimize the spread of pests, should they arise, and the use of air showers at entrances to ensure no foreign species are introduced can also minimize the risk of pests.

Software solutions are powerful in their ability to reach many people, but also present risks. The use of a smartphone application to facilitate online ordering of fresh food products presents the risk of excluding those who are less familiar with technology, or do not own a smartphone, from participating in the purchase of goods. In order to mitigate this issue, the ordering platform will also be accessible through a web browser, or orders can be placed in person at the Smart Farm location in the local mall. Furthermore, although direct-to-door delivery is designed to be the primary dispatch pathway, the Smart Farm is also intending on working with local grocery stores to make products available through the more conventional distribution pathways.

Offering a direct-to-door delivery service is risky due to the potential unreliability of vehicles, weather conditions, and variable costs associated with vehicle maintenance. In order to mitigate these risks, electric vehicles have been selected as the desirable platform for performing delivery. These vehicles have a significantly lower operating cost and decreased maintenance requirements. Cold weather driving range of electric vehicles is the primary drawback. In order to overcome this issue, installation of level 3 charging stations which can recharge an electric vehicle in as little as 15-20 minutes will be installed both at the Smart Farm and at the furthest operational location; Kelsey's Cranberry Portage. Secondly, by selecting a vehicle that has a suitably large battery back, the deteriorated cold weather range can be managed.

The biometric feedback study is intended to serve two purposes; provide an opportunity to showcase the effects of fresh produce on diabetes indicators in an academic setting, and to nucleate first hand community knowledge of the correlation between dietary choices and diabetes using real-time blood sugar monitoring technology. As with any study, participant drop-out is a risk to the integrity of the study (too few study subjects indicate the study is not statistically significant). Two measures have been considered to deal with this; providing a financial incentive for study participation as well as increasing the study design size so that if some participants drop out, the study does not become invalidated. The second risk that has

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been identified is the participants emotional response to being presented with their body's real-time blood sugar data. Stress and frustration are possible outcomes that may arise with this data. In order to address these risks, the study will be designed to occur in a series of small groups that include several study participants, a nurse and a dietician. This design is anticipated to offer the required support throughout the study process.

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3 CHAPTER 3: PROJECT MANAGEMENT

The scope of this project includes the development and operation of the three critical levers; Smart Farm technology, smartphone distribution system, and biometric feedback study. Operation of each of these business units is required in order to successfully leverage the desired community outcomes; achieve a decrease in imported fruits and vegetables and a decrease in diabetes rates.

It is important to bring each one of these business units to an operational state at the correct time and in the correct order to ensure both economical and effective project execution. The project work breakdown structure (WBS), which identified tasks associated with each activity, their resource type, duration, and predecessor, is presented in Figure 4 at the end of this chapter. Each task in the WBS is identified with a unique WBS#. These numbers are then called out in predecessor column to identify the tasks which must be completed prior to the task in that row; its predecessor task. The information contained in the WBS is presented in graphical form through the Gantt chart show in Figure 5 at the end of this chapter. The Gantt chart also illustrates the project's critical path. The critical path is defined as the shortest possible sequence of activities that achieves completion of an activity or project, considering duration and predecessor tasks. Financial milestones are overlaid on the Gantt chart to identify corelating trigger points for progress reporting (red diamonds) and subsequent funding installation release dates (green diamonds).

The project management critical path for this project is defined by 4 activities corelating to Chapter 2:

1. Build the plant factory
2. Initiate operation of the plant factory
3. Perform the biometric feedback study with community members
4. Distribute fresh food products to the community while tuning operational protocols to increase efficiency

Each of these four major activities can be broken down into tasks, some of which are serial and some of which are parallelizable. Scheduling of tasks must prioritize serial tasks on the critical path while ensuring timely completion of parallel non-critical path tasks.

Smart Farm operation and smartphone distribution system operation can be thought of as two pillars that support operation of the biometric feedback study; the biometric feedback study requires products from the plant factory to be delivered through the smartphone distribution system to participants to produce measurable biometric effects.

There are four categories of resources that are required in the development of this project:

1. Material
    a. Standard building materials (for example lumber, ventilation, electrical, etc)
    b. Real-estate (space to house the plant factory)
    c. Vehicles and supporting charging infrastructure
    d. Plant factory equipment (vertical farm, refrigerators, computers)
    e. Continuous Glucose Monitoring devices

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2. Contract labour
    a. Project coordinator / manager
    b. Engineer/architect
    c. Construction contractor for plant factory renovations
    d. Software developers / maintenance experts
    e. Nurse / researchers for biometric feedback study implementation
3. Operation labour
    a. Plant factory manager / supervisor / seeders / harvesters
    b. Delivery drivers
    c. Bookkeeper
4. Financial

One of the primary goals throughout the design of this project has been to maintain a vendor agnostic design so that this project can be replicated in any geographic location without being hindered by dependency on a particular supplier. Furthermore, this design serves to de-risk schedule delays and cost overruns that can arise with sole service / material providers.

3.1 Impacts on Stakeholders

The following list identifies the stakeholders that are impacted by our project or conversely, impact our project. We have also identified these groups in our engagement strategy in Chapter 6. Characteristics that make each of these stakeholders unique are:

1. Community members
    - Community members are the primary stakeholders in this project as its success impacts their access to more fresh fruit and vegetables options and thus may impact their health over time. Additionally, there will be employment opportunities created at the Smart Farm.
2. Businesses
    - Opportunity for synergies and supply of local fresh produce for their own enterprises.
3. Schools/youth
    - Opportunity for lunch program options, employment, and influencing family choices.
4. Citizens with disabilities
    - Increase access through direct to door delivery, food choice options
5. Elders/seniors
    - Increase access through direct to door delivery, food choice options, education
6. Government leadership
    - Increased community health, business opportunities, funding synergies, electorate satisfaction
7. Health partners
    - Health professionals can provide nutrition counselling to patients, knowing that there is access to healthy foods - a criteria for treatment of many chronic diseases including diabetes; data collection to support practice

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Response to feedback from these stakeholders is paramount in ensuring success of the project. Feedback is anticipated to come in the form of monitoring the relative popularity of the various food products, customer feedback via delivery driver interactions, surveys, and other forms of community engagement as outlined in Chapter 6.

3.2 Long-term Sustainability Considerations

The five-year project through Smart Cities Challenge is viewed as an incubator period, during which time external financial resources are leveraged to build capital assets, the Smart Farm and smartphone distribution system, and establish a sustainable business for long term operation and community impact. Upon commencing food production and distribution, it will be necessary to establish:

a) suitable pricing models that make these products more widely available

b) high value export markets in the form of product contracts to support revenue

c) administrative protocols that are efficient and effective

d) community awareness of the dietary decisions on health outcomes to promote increased community health

Following completion of the biometric feedback study, the three remaining business units will continue tuning these four variables with the goal of achieving financial self-sustainability so as to ensure the goals of decreased fruit and vegetable imports and decreased diabetes rates are sustained beyond the five-year lifecycle of the project.

3.3 Risk Identification and Mitigation

Except for the CGM devices, of which there is presently only one Health Canada certified device available, the Dexcom G5, the material resources required for this project can be provided from many different vendors. There are presently two known additional companies working to bring Continuous Glucose Monitoring devices to the Canadian market. Given that these devices are not required until partway through year 2 (approximately fall 2021) as outlined in Chapter 2, there may be alternative hardware available on the market by then. Furthermore, although much less insightful as to the relationship between dietary choices and diabetes indicators, point measurement blood sugar monitoring technology is readily available and could be performed more frequently amongst study members of the biometric feedback study.

Contract labour is used for those tasks which are not part of the ongoing operation of the plant factory. All tasks to be assigned to contract labour require specialized skills but are not locked in to any particular vendor. Construction contractors, nurses and researchers, as well as project coordinators are available either locally or within Manitoba. Some software developers are available in Manitoba, but these services may be solicited from elsewhere in Canada based on project scheduling.

Operational labour is readily available within the tri-community. Several of the OCN community members responsible for operation of the Smart Farm pilot project are already skilled with the operation of the Smart

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Farm technology and are acting as partners in the project to provide required training and knowledge transfer to the incoming staff.

The two greatest risks of the project are expanding lead times and cost over-runs related to resource procurement.

We have mitigated risks related to **procurement** through the preparation of requirements documents in advance during the finalist phase of the project, which were used to acquire more accurate quotes and lead times from several potential suppliers. Furthermore, many of the required material resources for this project are off-the-shelf items, for which quotes and lead times have also been secured. Consequently, the assignment of resources, human resources, material resources and financial resources, has been performed with a high degree of confidence. Further discussion on the financial resources required are discussed in Chapter 8.

The project schedule, as outlined in the Gantt chart below, is a comfortable, yet aggressive timeline identifying a step-by-step approach to timely project completion. Should resource procurement timelines slip, mitigating actions such as re-sourcing resource procurement or increasing labour resources will be taken to bring the project back on schedule. Financial resources have been assigned with a buffer in order to facilitate these types of de-risking measures. A dedicated project manager that monitors project progress is necessary to identify risks, should they arise, and take the required remedial action.

Procurement of materials and contract labour will generally be performed following acquisition of three quotes for materials that meet the project requirements and selection of the quote that offers the best combination of economy and lead time (de-risking schedule delays through selection of higher cost, lower lead time equipment may be desired as project delays also carry an embedded cost). Exceptions to this system are anticipated in those instances, such as real-estate, where selection will be performed based on greatest value add to the project and necessary duty to consult.

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WBS #	Task Description	Resource Type	Duration (months)	Predecessor(s)
	Financial Milestones			
1	Installment 1			
1.1	Receive Installment 1			
1.2	Progress Report 1 writing		0.5	5 7 9
1.3	Progress Report 1 Review GC		2.5	1.2
2	Installment 2			
2.1	Receive Installment 2			1.3
2.2	Progress Report 2 writing		0.5	6.6 8.3 (approx. 10% completion)
2.3	Progress Report 2 Review GC		2.5	2.2
3	Installment 3			
3.1	Receive Installment 3			2.3
3.2	Progress Report 3 writing		0.5	10.8
3.3	Progress Report 3 Review GC		2.5	3.2
4	Installment 4			
4.1	Receive Installment 4			3.3
4.2	Write final report		0.5	11.4
4.3	Submit final report for GC review		2.5	4.2
	Smart Farm Activities			
5	Build Smart Farm		19	
5.1	Secure space in Otineka mall	1	0.5	1.1
5.2	Work with architect/engineer to complete drawings	2	1	5.1
5.3	Order Smart Farm equipment from supplier	1	15	5.2
5.4	Assembly / Installation of Smart Farm	2	3	5.3
5.5	Renovations (Space preaparation)		17.5	
5.5.1	Hire general contractor	2	0.5	1.1
5.5.2	Order renovation materials, vacuum system, and fixtures	1	6	5.5.1
5.5.3	Build walls, install electrical, install fixtures	2	6	5.5.2
5.5.4	Order office equipment, harvesting carts, packing station	1	1	5.5.3
5.5.5	Setup Office space, carts, packing stations, staff room	2	4	5.5.4
6.1	Operate Smart Farm			
6.2	Hire custodian, planting staff	3	2	2.1
6.3	Staff training	2,3	2	6.2
6.4	Purchase cleaning supplies, mops, buckets, paper towel	1,3	1.5	2.1
6.5	Purchase seeds, rafts, sponges, etc	1,2	1.5	2.1
6.6	Planting and Harvesting	1,3	34	6.5
6.7	Partner with OCN Plant Factory to develop new protocols	2,3	33	6.6
6.8	Tune and evolve operating protocols	2,3	32	6.6
	Smartphone Distribution Infrastructure Activities			
7	Build Smartphone Distribution Infrastructure			
7.1	Setup contract with software company	2	0.25	1.1
7.2	Formulate complete specifications document	2	1.25	7.1
7.3	Programming	2	6	7.2
7.4	Acceptance testing	2	1	7.3
7.5	Deployment to server and tablets	1,2	2	7.4 5.5.5
7.6	Order charging stations, cable, and transformers	1,2	3	1.1
7.7	Install charging stations	1,2	2	7.6 5.1
7.8	Purchase 2 vehicles	1,2	6	1.1
8	Operate Smartphone Distribution Infrastructure			
8.1	Hire 2 drivers	2,3	1	2.1
8.2	Driver Training	2,3	1	8.1
8.3	Active product distribution	3	33	8.2 6.6 7.5
8.4	Purchase 2 additional vehicles	1,3	6	6.8
8.5	Hire 2 additional drivers	1,3	1	8.4
8.6	Driver Training	3	1	8.5
9	Create Biometric Feedback Study Framework			
9.1	Work with UofM, NHR, and OHA to design study	2	4	
9.2	Develop required procedures, forms and schedules	2	8	9.1
10	Implement Biometric Feedback Study			
10.1	Provide research contribution to partners	2	0.25	3.1
10.2	Collect study participants	2	1	9.2 3.1
10.3	Hire nurse(s) and phlebotomist	2	1.25	3.1
10.4	Order Continuous Glucose Monitoring equipment	1,2	1	3.1 9.2
10.5	Train nurse(s) on study requirements	2	1	10.3
10.6	Run study	2	13	10.5 10.4 10.2 10.1 8.3 6.6
10.7	Synthesize data	2	8	10.6
10.8	Produce final report	2	5	10.7
	General Activities			
11	Work with knowledge translation partners			
11.1	Establish partnership agreements with UofM, NHR, and OHA	2	1	
11.2	Uofm, NHR, OHA on study needs integration	2	18	11.1 10.6 4.1
11.3	NHR and OHA on Health Needs Assessment	2	4	10.6 4.1
11.4	Final report creation	2	4	11.3
12	Community Engagement			
12.1	Social media campaign to promote awareness of Smart Farm	3	6	2.1
12.2	Biometric feedback study entry/exit surveys	3	13	10.6
12.3	Survey 1 to community members on satisfaction	3	1	3.1
12.4	Survey 2 to community members on satisfaction	3	1	6.8 8.6
12.5	Facilitate periodic community cooking classes	3	27	3.1

Figure 4 work breakdown structure

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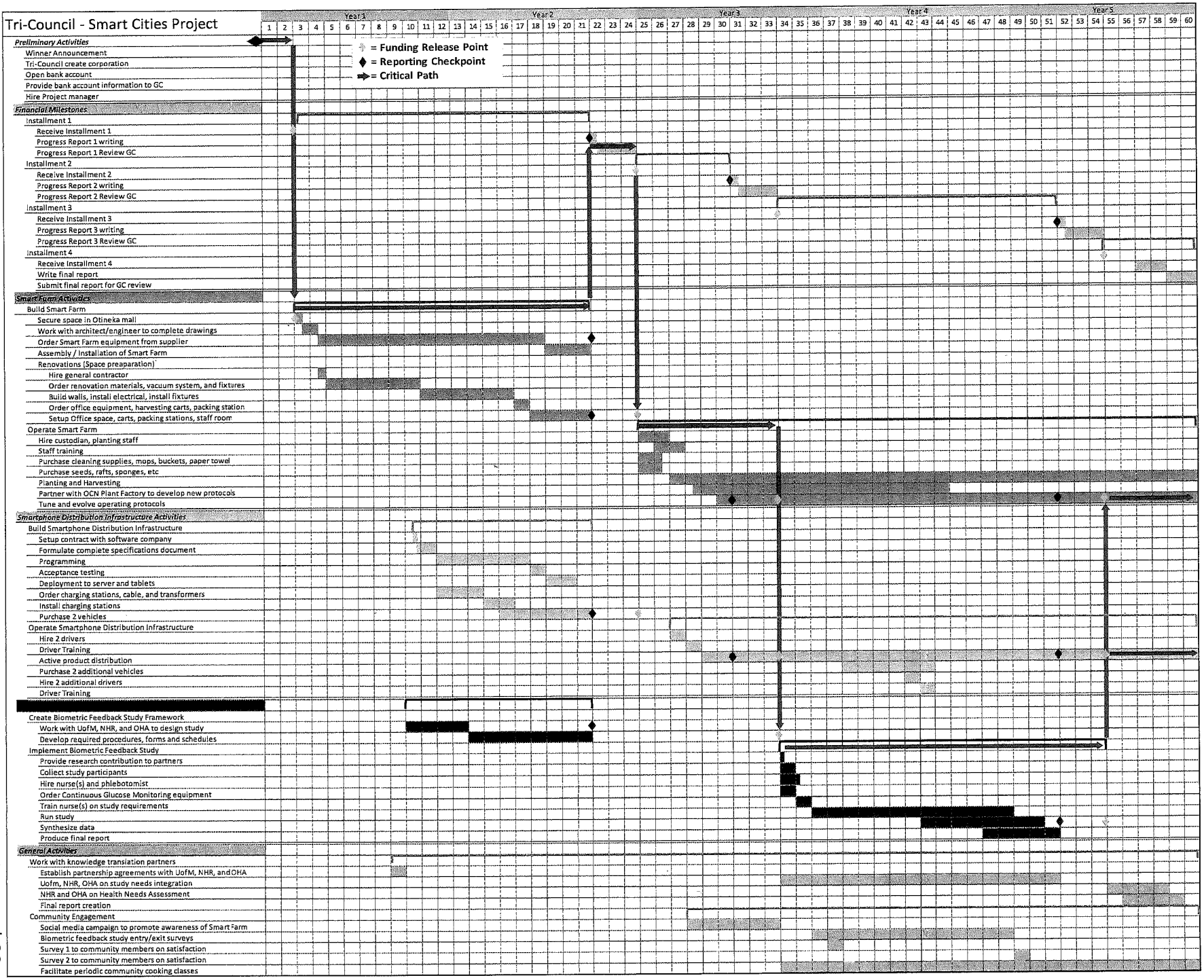


Figure 5 project Gantt chart

4 CHAPTER 4: TECHNOLOGY

Development of internet connected smart devices has grown exponentially over the past 5-10 years. The impact of this development has revolutionized many industries by providing technology solutions to overcome barriers that were otherwise insurmountable. This project will leverage several of these powerful, cutting edge technologies to address the challenges identified by our community.

Technologies leveraged by this project, further described below, include Smart Farm technology, a smartphone distribution system, and wearable biometric feedback devices.

A Smart Farm is the merger of vertical farming and the internet of things (IOT) connected technology, combined with cutting edge LED lighting control algorithms used for the year-round cultivation of food.

A smartphone distribution system connects community members with the Smart Farm and its products by leveraging the combination of an online marketplace smartphone application for the placement of orders, and a direct-to-door delivery system that utilizes electric vehicle powered distribution infrastructure to complete orders cultivated and packaged at the Smart Farm.

Wearable biometric feedback devices, specifically continuous glucose monitoring devices, provide a real-time window into the wearers blood sugar levels as well as a data logging solution so that this information can be shared with healthcare providers.

These technologies work together to provide a complete system which provides both the tools and feedback systems to improved health outcomes and local food security to the community. These technologies have been selected as they are familiar and have each been previously demonstrated to be effective at achieving their desired outcomes. A diagram illustrating the connection between each of the technologies used in this system and their location in the overall system operation is shown at the end of this chapter in Figure 6 below.

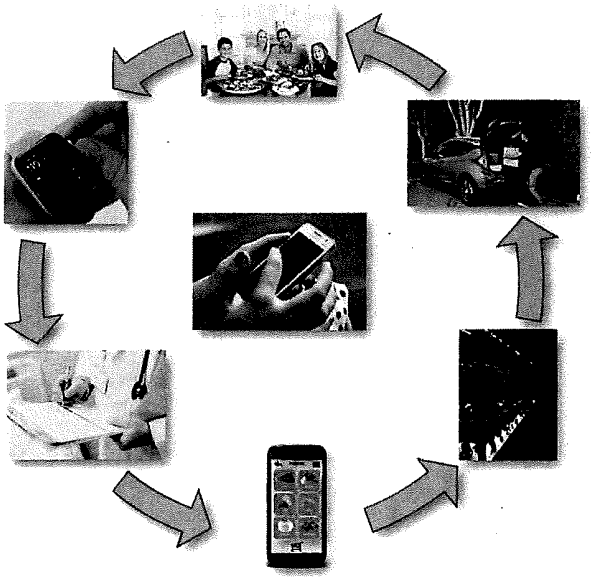


Figure 6 system flow diagram

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4.1 Replicability and Scalability

Although certain suppliers have been selected for the execution of this project based on the particular geography of this project site, their availability, price, and the established business relationships of the community, it should be clear that the framework laid out in this project, namely food production, food distribution, food ordering interface, and biometric feedback, are technology agnostic; many different types of technology can be used to fill the function of each block. This allows for utilization of alternative suppliers or technological approaches, depending on the availability and requirements for deployment of this project to other locations in Canada. This ensures that the project is both replicable and scalable. For example, the use of electric cars is recommended for this project; however, any vehicle ranging from conventional cars to drones to hovercrafts to helicopter could be used if this technology was more suitable for operation in another geographical region. Similarly, the Smart Farm technology supplier has been selected from Korea based on a multi-year business relationship that has previously been established with OCN and the fact that many staff are already quite familiar with this system. However, any vertical farm technology from an alternative supplier, and even similar technologies such as aquaponic systems, could be substituted for this role; so long as they facilitate year-round food growth.

4.2 Detailed Discussion

4.2.1 Smart Vertical Farm

Vertical farming technology leverages hydroponic technology, combined with "bunk-bed" style layered grow beds, to increase food growth capacity per unit area of indoor floor space. Hydroponic technology, the practice of growing plants without the use of soil, has been practiced in various forms since the early 1600's. OCN, in partnership with the Korean Agricultural Systems and Technology (KAST), installed one of KAST's Smart Farms as part of a demonstration project that commenced in 2016. The Smart Farm, or more generally a vertical farm, has successfully demonstrated the ability to produce 98 different species of plants ranging from leafy greens and herbs to calorie dense root vegetables and fruit. Demonstrating the ability of an agricultural technology's ability to grow calorie dense vegetables and fruits year-round is critical to address issues of food security in Northern Canada.

KAST is one supplier amongst a multitude of suppliers for vertical farming hydroponic equipment, so procurement from this supplier is not critical for project success. However, KAST has poured extensive research into development of their now patented lighting control system which increases energy efficiency while accelerating plant growth.

The KAST Smart Farm technology is far from experimental. KAST has deployed system that are successfully operating all over the world, with key markets including Japan, China, Korea, and USA.

Through implementation of the demonstration project, KAST was required to establish cUL certifications for all their equipment to ensure its conformance with electrical safety standards in Canada. This was successfully established and now they are fully prepared to provide equipment for this project and more projects into the future. There are no regulations surrounding the use of vertical farming technology for the cultivation of food; however safe food handling regulations will need to be followed and periodic

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testing will be required to ensure quality of the plants. Clean and safe work environment practices will also need to be followed to ensure staff and customer safety. As part of the demonstration project in OCN, all staff have received safe food handling certification, a practice which will continue on to new staff throughout this project, supported by the management staff of OCN's Smart Farm pilot project.

All seeders, harvesters, and packagers will be trained on the operation and maintenance of the equipment as required. Only trained staff will be permitted to operate or become involved in the Smart Farm operations. This will ensure contamination free high-quality product.

One of the risks to using foreign technology is bottlenecks in the supply chain for consumable items. This has already been experienced through the demonstration project and local suppliers are being sought out to mitigate future supply chain issues. Since the Smart Farm is remotely controllable, another risk could be remote high jacking of the control systems. This is primarily mitigated through the use of encrypted communication protocols and high security login credentials.

4.2.2 Smartphone Distribution System

4.2.2.1 Smartphone Distribution - Software

Online marketplaces have been growing in popularity over the last decade because they are easily accessible to a large group of people (those with smartphones or a computer), they minimize the requirement for a bricks and mortar location for the business, and they are deployable over a much larger customer area. Online banking is an example of how a software application has revolutionized rural locations. Prior to the development of smartphones, it was necessary to travel, sometimes hundreds of kilometers, to deposit a cheque or transfer funds. Online banking, accessible through the smartphone application interface, has made it possible to perform these tasks quickly, regardless of geographic location.

A smartphone ordering application will be used to connect community residents with products from the Smart Farm by providing an online marketplace where users can see available products and order those products for delivery to their door. To ensure community members are provided with up to date product information, regular updates will be required by the Smart Farm manager to ensure the products available so that they are reflected in the online storefront.

Customers can view these items through the ordering application and select which items they would like to purchase. Accompanying the available products display will be a list of recipe suggestions for that particular product. Selecting a recipe will provide a list of required ingredients with the option of filling the shopping cart with all of the items offered by the Smart Farm that are required for that particular recipe. Alternatively, browsing can be done by recipe. Selecting a recipe will display the required ingredients, and, again, the option to fill the shopping cart with products available from the Smart Farm will be available. Through the customer application, there will also be an option for viewing order history and account information.

Drivers will also have an application interface that shows the delivery destination and the order number that needs to be dropped off at that particular address. This will ensure the driver brings the correct package to the correct destination.

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Like any online store, there will be a requirement for a central product database to store product information as well as account information of users. Minimizing the amount of information that is stored for each customer is step one. Secondly, security will be maintained using standard SSL encryption techniques on all communications as well as encryption of the data on the server. Payment processing will certainly be a required task for this software solutions, so a secure eCommerce platform such as Magneto, an industry standard Adobe product, will be used. Although the majority of Canadians carry at least one credit card, there are still individuals who do not prefer to own a credit card or use if for online shopping purposes. Therefore, one of the other features that will be incorporated into the smartphone ordering application will be the ability to carry an account balance that can be recharged using cash at the Smart Farm. Privacy considerations for the commercial activity of the Smart Farm fall under the authority of the Office of the Privacy Commissioner of Canada (OPC) and specifically the Privacy Information Protection and Electronic Documents Act (PIPEDA) that is discussed further in Chapter 7. Upon implementation of this project, we will work closes with OPC to ensure that we comply with all necessary legislation and privacy considerations.

Compatibility of the smartphone application will comply with iOS and android operating system standards so as to ensure that, regardless of a user's desired platform, this service will be accessible. Furthermore, updates will be made available as needed to ensure customer feedback can be incorporated into the operation of the software, and that compatibility with future operating systems is supported. Making the application available in the Android Play Store and the Apple App Store will ensure that it is easily distributed to anyone in the community, and with potential future expansion of the distribution infrastructure, scaling services into additional communities can happen seamlessly.

The vertical farm requires several consumable items for its operation and securing a timely supply of those consumables is critical for de-risking successful ongoing operation of the vertical Smart Farm. These include Styrofoam rafts for floating the plants above the nutrient rich water, nutrients for mixing with the water, and foam cubes for germination of the seeds. As the demonstration project between OCN and KAST has progressed, it has been identified that there are often delays when procuring these items from Korea and so local suppliers are currently being sought out.

4.2.2.2 Smartphone Distribution - Vehicles

There are several technologies included with the electric vehicle distribution system including electric vehicles and electric vehicle charging stations. As with each of the four portions of this project, the particular vehicle which is selected is not overly critical for success of the project; although suitable size and range are certainly considerations for effective completion of tasks.

Electric vehicles have been gaining popularity around the world due to their decreased operating cost, zero emission characteristic, and decreased maintenance cost over their liquid fuel powered predecessors. As battery technology advances, the range that an electric vehicle can travel is ever increasing which makes these vehicles increasingly viable for more people living in Canada's sparsely populated Northern regions. Consideration of these characteristics provided the foundation for exploration of the viability of electric vehicles for this project.

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The RM of Kelsey's Cranberry Portage is located 80km North of OCN and The Pas. In order to complete a round trip, it was established that a minimum range of 160km with a 30% margin was needed as a minimum; 200km range. Furthermore, since battery chemistry yields decreased energy delivery at cold temperature, accounting for an additional 50% range reduction was determined to be required in order to ensure that 200km could be travelled in cold weather. This left two currently available vehicles as options, the Tesla Model 3 or the Chevrolet Bolt. Based on many Canadian owner reports of cold weather performance, the Chevrolet Bolt will lose up to half of its range when operating below -30C, which means a range of roughly 190 km. In order to further de-risk the possibility of running out of energy on the highway, a rapid electric vehicle charging station will also be placed in Cranberry Portage so that recharging can take place before returning to the Smart Farm.

Installation of 50kw+ rapid DC electric vehicle stations (Level 3 charging stations) are required in Canada in order to enable inter-city and rural travel. Given the 600km journey from The Pas to Winnipeg, and that the best electric vehicles have a range of 400-500km per charge, there is still a requirement for rapid reenergization of vehicles. By contrast to Level 2 recharging stations which are commonly installed for around $2,500 and will recharge an electric vehicle in 6-9 hours, a Level 3 charging station costs roughly $50,000 and enables vehicle recharging in 15-30 minutes; this is currently the only path forward for Canadian highways and rural destinations.

There are several manufacturers of level 3 charging stations around North America and they all offer CSA and/or cUL compliance and compatibility with the two universal charging connector standards; CCS1 and CHAdeMO. One of the leading Canadian suppliers for this technology is a company called FLO which is located in Quebec. FLO offers charging stations that are unparalleled in their cold climate functionality and tolerance, and are also partners with the US giant Chargepoint, which means they have a reciprocal agreement for payment account usage at stations. Use of FLO or Chargepoint hardware is not required for recharging functionality, but since they are leaders in charge station location software and payment logistics, it makes reasonable sense to work with them.

One of the leading electric vehicle manufacturers today is Tesla Motors. Tesla has designed and is deploying their own proprietary supercharger stations which accomplish a similar rapid recharging function as the Level 3 chargers, however Tesla vehicles also use a proprietary connector for interfacing their cars. In order to increase adoption rates of Tesla vehicles by making them more universally usable, Tesla provides an adapter to their proprietary connector which enables compatibility with the CHAdeMO connector. There is no reciprocal connector, however, which would enable a non-Tesla electric vehicle to charge at a Tesla supercharging station. With this in mind, a Level 3 charging station with the universal CCS1 and CHAdeMO connectors ensures compatibility with all future electric vehicles.

Electric vehicle charging stations do not operate in the same way as conventional fuelling stations insofar as an attendant and cashier are waiting to take your payment. Electric vehicle stations operate more like the cardlock system used for long distance trucking organizations, where fueling is done in a self-serve manner and payment is done by card at an unattended kiosk. One of the advantages to this system is that there is

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no labour cost to operation of the system so installation of these Level 3 provides a benefit to not only the Smart Farm distribution fleet, but also the community at large with no additional cost to Smart Farm.

4.2.3 Biometric Feedback System

Continuous glucose monitoring (CGM) technology is a wearable device that samples blood glucose continuously throughout the day and provides real-time feedback to the person wearing the device. There is one company currently operating in Canada called Dexcom that provides this CGM device. This device uses a very small subcutaneous needle to monitor glucose levels of the wearer. The device that Dexcom provides also houses a Bluetooth transmitter so that the readings from the glucose sensor can be broadcast to the smartphone of the user for real-time display. The user can then establish correlations between dietary habits and blood glucose levels, choose to optionally share their data with family and friends, or choose to share their data with a healthcare provider for greater insight into their health and health care requirements.

Dexcom G5 CGM devices are currently used successfully by patients all over the world. The Dexcom G5 device became available in Canada in 2016 after certifying that it complied with all required regulations. In 2018, Health Quality Ontario released a report indicating it is strongly in favour of publicly funding the use of CGM devices for those with severe diabetes since the results are very positive. Although Dexcom is currently the only CGM device available in the Canadian market, there are several other companies including PKVitality and Medtronic that promise CGM devices to become available in the coming year or two.

The scope of this project's use of CGM devices is for the monitoring of a study group to assist in increasing community knowledge by providing real-time feedback on the correlation between dietary choices and biometric parameters. As such, training on the device use will be provided by health care professionals to ensure individuals feel secure on the proper use and operation of the device. Individuals in the study group sign a consent form indicating that they choose to share data collected via the CGM device with their health care providers. As per the provincial legislated authority, the Personal Health Information Act (PHIA), the personal health information of the study participant will be maintained in a confidential manner. We have met with the provincial Ombudsman in Manitoba and have discussed, in Chapter 7, our review of this legislation and the necessary steps we will take during the implementation phase to comply with all legislative and regulatory requirements.

One of the risks of using this type of technology is that by providing new information to the study group participants, these individuals may become anxious or overwhelmed. Meetings with health care providers and learning circles, provided at the health centre, provide opportunity for study group participants to receive support throughout this process.

4.3 Purpose for Using Technology

Local production of food using vertical farming technology is seen as an excellent approach to making high quality fresh produce available year-round since it removes the requirement for international trucking to

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connect farms located in the southern US, Mexico, Central America, and other various tropical destinations with communities in Northern Canada. This means that food produce:

- Is fresh, as it can be consumed on the same day it is harvested
- Cost has a decreased dependence on liquid fuel and other transport costs
- Security is less dependent on international trade politics, and
- Availability is not impacted by weather and road conditions

The main barrier to year-round food production in Canada is the sub-zero climate. This is experienced for over half the year depending on location; The Pas, OCN, and Kelsey can experience sub-zero temperatures from early October through late April. Vertical farming technology enables local year-round growth of fruits and vegetables regardless of the outdoor climate.

Vertical farming systems are manufactured all over the world, with maturities ranging from home built to commercial grade. OCN, in collaboration with the Korean Agricultural Science and Technology organization (KAST), a Korean manufacturer of advanced commercial vertical farming technology, commissioned a pilot project to demonstrate the effectiveness of KAST's vertical farming technology in Canada. The project was initiated in 2015 and has successfully demonstrated the ability to grow 75 varieties of various fruit and vegetable species.

KAST's vertical farming technology leverages a unique lighting control system to accelerate plant growth. It is claimed that this control system provides accelerated plant growth over competitor lighting systems. While this is a challenging claim to prove or refute, KAST's vertical farm technology has become familiar to many of the community members in OCN, The Pas, and Kelsey, and the established business relationship is valued by community leaders.

One of the shortcomings that has been identified with many other hydroponic systems that have operated in Northern Canada is that they primarily produce leafy greens and low-calorie products. The demonstration project plant factory that was installed by OCN in 2015 has successfully demonstrated the ability to grow high calorie vegetables such as beets, radishes, kohlrabi, cabbage, broccoli, cauliflower, and carrots. The ability to grow high calorie vegetables with this system proves its viability as a Northern Canadian food security solution.

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5 CHAPTER 5: GOVERNANCE

As per our challenge statement, we as the Tri-Council entered the Smart Cities Challenge for the purpose of the health and well being of the community. This goal has led us to determine that the appropriate governance model for the project is a not for profit corporate structure. To this end, each of the three governments has signed a council resolution in which they agreed to proceed jointly in this manner and to create a Board of Directors for the not for profit entity which will see equal representation from each of their respective governments, as depicted on the Figure 7 below.

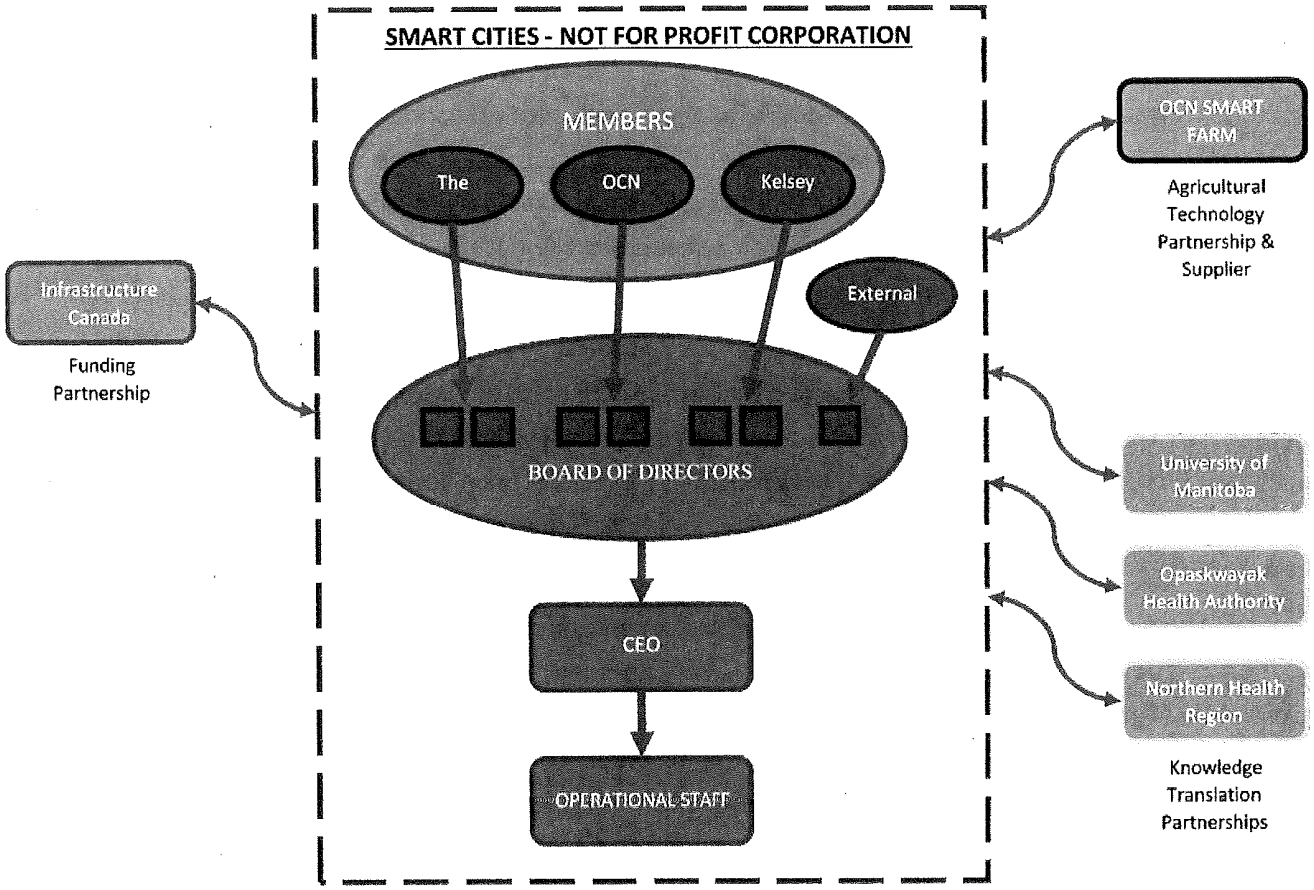


Figure 7 not-for-profit corporate structure diagram

Our not-for-profit corporation will be established under the auspices of The Corporations Act (Manitoba). Figure 7 above depicts our structural organization. In green, we have our membership which will be comprised of the elected officials that make up the three government bodies of the Tri-Council. Each of these governments appoints two representatives to the Board of Directors which will also have an external member, appointed jointly by the Tri-Council. The Board of Directors is responsible for hiring the CEO to provide operational management to the business as per this proposal and oversight to the operational staff working in the business.

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The diagram also depicts our partners, colored differently to denote that they have different functions as partners. Our partners include:

- Infrastructure Canada, the **funding partnership** who will release funds as per our outcomes-based agreement and to whom the Board will provide ongoing reports as required
- Opaskwayak Cree Nation LED Smart Farm, is the **agricultural technology partnership**, providing knowledge, training and ongoing technological advancements to the vertical smart farm as well as the supplier of the smart farm technology.
- University of Manitoba and the Northern Health Region, the **knowledge translation partnerships**, work with us to move our research and data into the hands of our health care providers and community members to put the knowledge we gain into practical use to reach our intended outcomes.

Our partnerships have been established over time and each have strong governance structures and resources, such that they make stable partners with whom we can collaborate and build our success.

5.1 Readiness of partners

- OCN LED Smart Farm - has developed and operated the Smart Farm over the past four years with support from their relationship with the Korean Institute of Science and Technology (KIST) and Korean Agriculture System and Technology (KAST). This partnership began with Opaskwayak Cree Nation in 2015 and is ongoing as the vertical smart farm is currently functioning as a test and training site as well research and development of at least 75 food products, feeding approximately 100 people at this time. OCN has obtained distribution rights for the Korean technology and the have an agreement in this regard.
- University of Manitoba – will provide a researcher for our project by the name of Dr. Miyoung Suh. Dr. Suh is an Associate Professor in the department of Human Nutritional Sciences. She has experience in research and translating knowledge to the medical profession as well as the general public. She has experience in the area of practice-based research for dietetics. Having completed prior research in the area of prenatal health in Opaskwayak Cree Nation, she is respected and trusted by community members.
- Northern Health Region - through ongoing collaboration on program development and resource sharing as per our joint steering committee on health, the NHR is a long-time partner and has agreed to continue to work together to support this project. In particular, the NHR will provide the primary health care support for the research participants and any other community members willing to consider health care support and changes to lifestyle to improve the quality of their health. They have provided physicians and the electronic medical record to the Beatrice Wilson Health Centre located in Opaskwayak Cree Nation.

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- Opaskwayak Health Authority (OHA) – OHA is responsible for the health services delivered on reserve at the Beatrice Wilson Health Centre. We submitted the required Research Lens in Ethical Decision-Making as directed by the OHA Board of Directors, and they have approved it. Furthermore, they have indicated that this research is very necessary for the community and are grateful for the opportunity.

Over time, we have built relationships based on policies and agreements, but more importantly, on trust, which enables us to move nimbly as we set directions for our Board of Directors and their staff. With our business model, governance model, and overall plan, these strong partnerships also enable us to expect the success we are bound to have with this project.

The role of the Board of Directors is one of policy governance, although will function as an operational Board at the early stages of project implementation. The operational role of the Board will be to hire an Executive Director and determine policies and procedures that will support the Executive Director to carry out the goals and objectives and achieve the outcomes as documented in Chapter 3 of this proposal. When the Executive Director is comfortable in carrying out the functions of the business, he or she will report regularly to the Board. The Board will then shift from an operational focus to one of setting strategic direction, establishing governance policies, and supervising the Executive Director. The Board will have policies outlining the relationship between the Executive Director and Board members.

The governance structure we have created to proceed with our project is based on sound principles of governance. These are as follows:

1. Well defined goals and objectives
    - We have completed extensive community engagement, examined current research and developed a model, created a five-year plan of business milestones and supported this with outcomes-based performance measurement goals
2. Evaluation of resources
    - We are supported by cohesive relationships among governing partners, experience in working with corporate structures, strong workforce, supportive and contributing partners, business knowledge and access to external expertise
3. Planned processes
    - Details of the business have been created within this proposal and lessons have been learned from the three years the smart farm has been in development prior to this project was proposed
    - Financial accountability following best business practices, including an annual audit, is a key process of the Board

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4. Governance lead
    - Membership of the not for profit corporation consists of the elected official from the three government bodies that comprise the Tri-Council including:
    - OCN - Onekanew (Chief) and 7 Onuschekewak (Council)
    - RM of Kelsey – Reeve and 6 Councillors
    - Town of The Pas – Mayor and 6 Councillors
    - Membership will lead the Board of Directors with a mandate, through election, from the community members they represent
    - Membership, and the Board, will also be informed of the needs and wishes of community members through ongoing engagement as described in Chapter 6
5. Scalable documentation and processes
    - The utilization of technology such as the server database of the smart farm and distribution business, central to this project, allows for anonymized data and trends to be gathered in a clear and concise manner. This would include details such as logistic costs, consumption patterns, customer preferences, utilization of delivery versus pick-up, etc. This documentation in turns assists the Membership, Board of Directors and Executive Director to make ongoing business and business process decisions based on information that can be compartmentalized to each of the processes within the system.

5.2 Strengths of our governance structure include

- Local control
    - Members of the not for profit are elected by community members
    - Board of Directors is appointed by Members
    - Board of Directors hires the Executive Director
    - The Executive Director hires community members to work in the business
    - Products of the business enhance the health and well being of the community members
- Transparency of the not for profit corporation
    - Public by-laws
    - No hidden owner
    - Business enterprise is invested into the community
    - Distribution pathways are clear
    - Financial management as per the Canada Not for Profit Corporations Act
- Value for investment
    - Product of the business improves health and well being of the community
- Simplicity
    - Strong governance structure in its simplicity

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5.3 Risk Identification and Mitigation

1. Disagreement among members of the Board of Directors
    - Mitigation: We have developed a list of items in our unanimous member agreement which require approval by Extraordinary Resolution. "Extraordinary" approval is an 80% threshold, so for all intents and purposes, the requirement is unanimity considering the three parties identified as members.
2. OCN no longer acts in its capacity as agricultural technology supplier
    - Mitigation: We have a preference for the Korean technology which is supplied to the Smart Farm project for which OCN acts as a supplier. However, should their ability to act as a supplier become compromised, the success of the project is not dependant on them: alternative suppliers can be sought.
3. Knowledge translation partnerships dissolve
    - Mitigation: If the University of Manitoba partnership dissolves, alternative researchers at other Universities can be identified and hired. If NHR and OHA do not want to contribute towards supporting the research project, the University of Manitoba has identified that they will send up research assistants from their facility.
4. Delayed payment from Infrastructure Canada
    - Mitigation: Clearly defined timelines, outcomes, punctual reporting practices, early discussion on schedule changes.
5. One partner discontinues ongoing participation
    - Mitigation: The Board of Directors will reorganize themselves to accommodate for circumstances but continue to function as oversight for the project.

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6 CHAPTER 6: ENGAGEMENT

The nature and size of our three communities, along with our long-established methods of intra-community communications, has enabled us to conduct broad and diversified engagement activities throughout the project definition and scoping processes, leading to our current position as a finalist in the Challenge. Our initial engagement involved brainstorming sessions with community leadership and active community members to identify key community needs. As we worked through development of our initial proposal, we broadened our engagement to further assist in sculpting the project. Our ongoing engagement activities look for the ideas, opinions, needs and vision of our diversified population ranging from youth, elders, families, businesses, special needs groups and our elected government officials. Through these activities, we have established a framework for engagement that we will continue to use throughout the implementation phase of our project.

The tools that we have utilized throughout our engagement process include:

- Surveys – business and general population
- Forums – special needs groups, business, leadership, health
- Social media – Facebook
- Scheduled feedback - groups that hold regular meetings and include Smart Cities on their agenda including governments, business, health, Boards
- Focus groups – people living with diabetes, disabilities, high risk youth, elders

Our engagement throughout the development phase has provided us with valuable insight and perspective as we shaped our project for future success. Insights gained are summarized below.

6.1 Community Engagement

6.1.1 General population

To ensure that the community would benefit from and support the goals of this project, our initial information was collected from the general public in all three communities by utilizing online and paper surveys that were completed at focus groups, the local grocery stores, schools, workplaces and community-based organizations. In order to obtain unbiased and comprehensive data to use moving forward, the surveys were completed by community members of all ages and demographics such as mothers, at-risk youth, elders, families with and without children, single adults, and people living with and without diabetes. Surveys were filled out anonymously to allow participants the opportunity to complete them openly and honestly. They were able to supply contact information if they wished to participate in further data collection such as focus groups or if they wished to be part of the future study group. We have had success in the past on other projects utilizing this method of data collection to engage community members and stakeholders and will continue to use it moving forward to collect information while informing the community about the status of the Smart Cities Challenge.

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The surveys focused on:

- Impact of diabetes on the community
- Barriers to purchasing fresh produce
- Types and frequency of vegetables being purchased by the community
- Amount of the produce purchased thrown away due to spoilage
- Interest in and benefits of a delivery service
- Interest in a smart phone app to order produce and access recipes
- Interest in participation in a research group that utilizes wearable technology to monitor blood sugar to assist with controlling or preventing diabetes for the wearer.

We learned that 92% of community members feel that diabetes is a high priority issue that needs to be addressed immediately, 49% of participants said that either themselves and/or a spouse/child suffered from diabetes and 28% said that someone in their extended family is currently living with diabetes. The majority of those who are living with diabetes in their family would be willing to make changes to their diet and eating habits to minimize the impact on their bodies. They stated that being supplied with fresh vegetables would be a great incentive for them to participate in a group study and that they would participate in a study using wearable technology to track and monitor their blood sugar.

The most popular type of fresh produce currently being purchased in the community is leafy greens; 83% of participants who purchase produce at least once/week purchase leafy greens. To date, leafy greens are the main type of crop grown at the OCN pilot Smart Farm and are also one of the dietary items that can be beneficial in combatting diabetes. When asked if they would be more likely to consume fresh produce if it was locally grown, cheaper to buy and free of pesticides/chemicals, 88% of all participants answered that they would eat more if it was healthier and more accessible.

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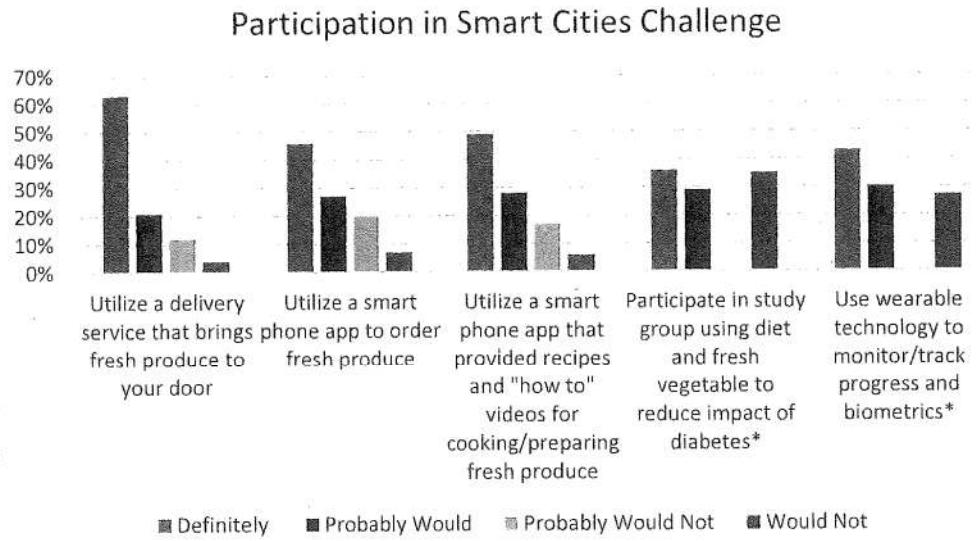


Figure 8 community survey results regarding scope definition of Smart Cities Challenge

This chart outlines the willingness of community members to participate in the Smart Citi
*24% of survey participants responded that they were not affected by diabetes, there v
applicable" answer option provided for them to choose.

[redacted]

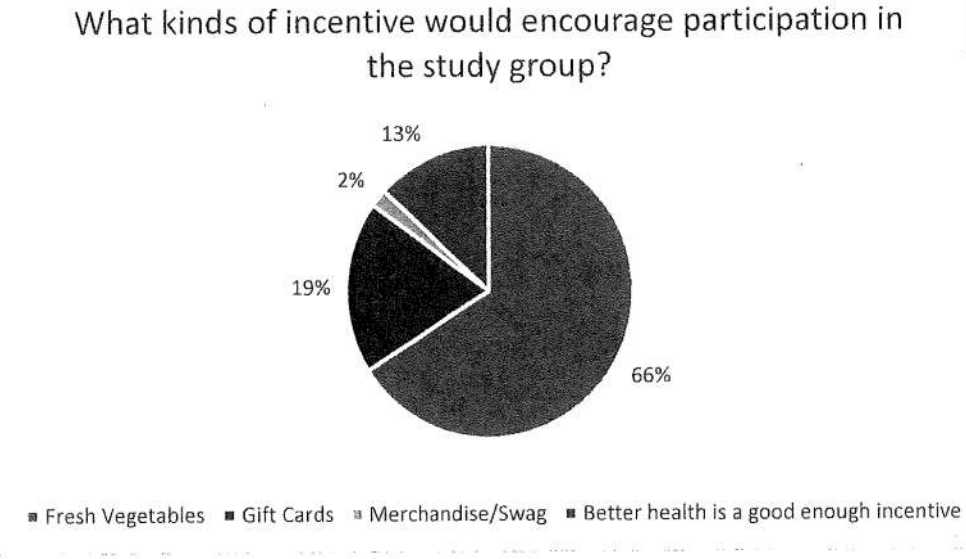


Figure 9 community feedback on desired study group participation incentive

This chart demonstrates that having access to fresh vegetables provides incentive for people living with diabetes to eat better which will help to control their blood sugar. Having locally grown produce available that is cheaper and more accessible will be beneficial in diabetes management for the

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Social media is another common form of communication and source of feedback in our community. Our working group utilized Facebook to build our online presence, communicate with the tri-community and encourage participation in the challenge and community engagement strategy. The OCN pilot Smart Farm has an existing page with well established followers that is used to share posts, events, progress and online surveys. Posts made on this Facebook page reach anywhere from 500-5000 people who engage in the information being provided. Posts include information on diabetes education sessions, telehealth information sessions, cooking classes, services available, diabetes and health eating educational/informational posts, produce availability at the farm, online surveys for community members and businesses, Smart Cities updates, meetings and events, news stories, recipes and information on partners and stakeholders. We will continue to utilize the Facebook page to engage community members with targeted and scheduled posts. The page also gives us the ability to communicate and engage with people and potential consumers throughout the region, province and country.

Information and resources were provided to those who filled out surveys or participated in focus groups so that they could access services and support if needed. They were provided with contact information for health care professionals of both the Opaskwayak and Northern Health Authorities as well as information on up and coming education and information sessions. They were also provided with information on how to keep up-to-date with the Smart City Challenge progress and happenings.

6.1.2 Business Leadership

- ✓ Chamber of Commerce (150 members), Rotary Club (50 members)

A forum was held with members of the local Rotary Club. The club is comprised of local business people and professionals from many different vocations such as health care, education, finance, human resources, communications, media, agriculture, and other business representatives. The Club was provided with information on the Smart Cities Challenge project proposal. Following interest in this opportunity, there was further discussion regarding the current Smart Farm's production capabilities including the different kinds of crops and harvest times. Club members were asked to provide information on:

- quality and quantity of produce they are currently purchasing
- barriers they may face in purchasing fresh produce
- whether or not their family were impacted by diabetes, and
- what could be done to encourage more consumption of fresh produce.

The group responses indicate that one of the biggest barriers or concerns with current produce availability was the shelf life, stating it is much too short which leads to spoilage and waste. They further stated that if there were locally grown options with a longer shelf life it would very likely increase their consumption rates. The group had a lower rate of diabetes amongst themselves and their family at 27%, however the majority said they would still find information and education regarding diabetes and healthy eating beneficial.

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The local Chamber of Commerce participated in a focus group and were asked to complete a survey for local businesses. The survey focussed on:

- The type of produce shipped
- Quantities
- Cost
- Shelf life
- Amount of waste/spoilage
- Challenges with current produce suppliers
- Frequency of shipments
- How likely they would be to use/purchase produce from the Smart Farm

The results of this survey are shown graphically in Figure 10. Of the businesses who were surveyed, 57% indicated that they use or sell fresh produce in their business with the most common being fresh leafy greens, root (potato, carrots) and edible plant stem (celery, asparagus) type vegetables, cruciferous vegetables (cauliflower, broccoli) allium (garlic, onion) and marrow (cucumber, tomato) type vegetables.

43% of businesses that use fresh produce receive shipments 2-3 times/week, 15% receive shipments 4-5 times per week, 42% receive shipments once per week. The average shelf life of the produce being delivered is anywhere from 3-10 days. Leafy greens have the shortest shelf life while root vegetables have the longest shelf life. 100% of businesses who use fresh produce stated they would be likely or very likely to use a local option that is less costly, has a longer shelf life and is free of pesticides/chemicals. 67% of these businesses feel they would definitely sell or use more fresh produce if there was a local, clean, less costly options and 33% feel they probably would sell/use more produce.

This information will be beneficial for the implementation phase of the project as it provides information for consideration and identifies what type of produce may be the focus to best meet consumer needs.

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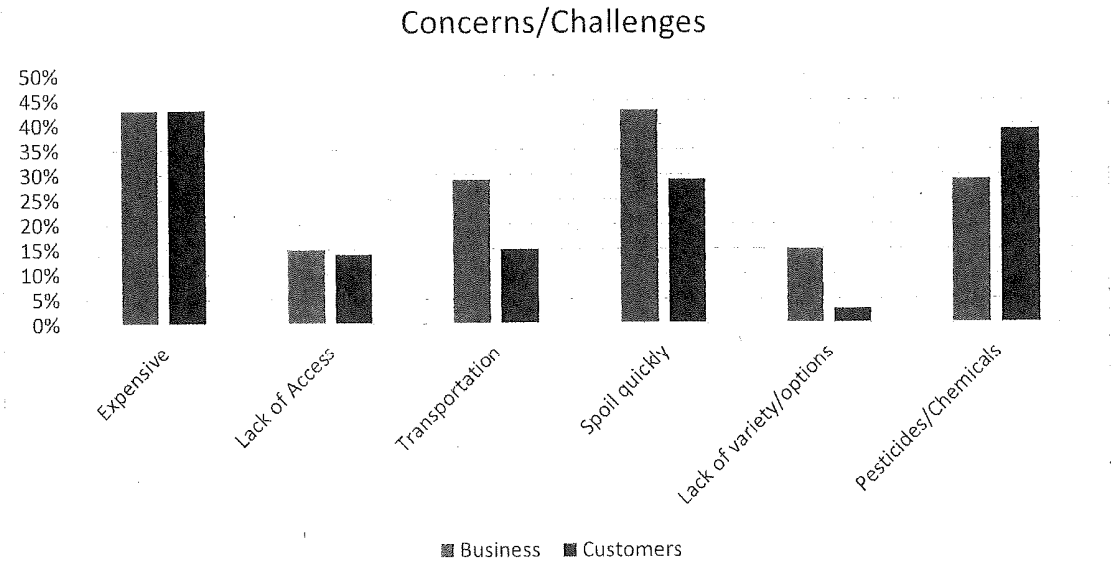


Figure 10 community feedback on present food source concerns

This graph indicates that our proposal recognizes and addresses primary concerns of both businesses and customers. The three most critical concerns are expense, spoilage rates and use of pesticides, closely followed by transportation. Transportation is a greater concern for businesses, spoilage is a consequence of transportation.

6.1.3 Youth - Ages 13-21

- ✓ University College of the North
- ✓ MBCI
- ✓ PACE
- ✓ Oscar Lathlin School

In order to engage the youth of the tri-community, focus groups were held and surveys were completed by schools in each community. We also used the opportunity to provide education and resources on the benefits of eating fresh produce. Lack of access to fresh produce was revealed as a huge barrier for the youth in the community. With 47% of youth who participated stating that they did not have access to fresh produce at home. Some of the top reasons provided by youth as to why parents/caregivers did not buy fresh produce were high costs, quick spoilage, as well as the convenience and cost efficiency of buying frozen alternatives. This feedback is illustrated in Figure 11 below. The clear message that came from the youth was that there was a desire to eat fresh vegetables, but lack of accessibility was a major roadblock. They also stated that school cafeterias were not able to provide many options to purchase fresh produce for lunches due to high costs and short shelf life, and if there were more options available, they would likely consume more fresh vegetables. Youth identified that access to cooking classes and education sessions would be highly beneficial to them and make it easier for youth to eat more fresh produce because they would know what to do with it.

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Almost all of the youth who participated stated they would be interested in using a smart ph
they could order fresh produce for delivery as well as accessing recipes and videos to assist
preparation. Culinary students expressed an interest in producing videos to post on Faceboo
smart phone app. Youth who are impacted by diabetes also stated they would be willing to
study group utilizing wearable technology to monitor blood sugar and other biometrics to le
control their blood sugar, thus managing their diabetes. Youth said it would be cool to parti
competition amongst their peers.

6.1.4 Elders/Seniors

- ✓ McGillivray Care Home residents
- ✓ Council of Elders

Focus groups with the Elders of the community revealed that they would consume more fresh produce and leafy greens if they were taught how to incorporate them with the traditional dishes that they are used to preparing. This information is illustrated in Figure 11 below. Half of the elders who participated in the focus group disclosed that they were living with diabetes. Of those who had been diagnosed with diabetes almost all said that they would be interested in further information and learning more about how making dietary changes could improve their health and assist them to have better control over their blood sugar. The Elders would be willing to participate in the study group and use wearable technology to monitor their blood glucose. Fifty percent of the Elders who are living with diabetes would use a smart app for produce delivery and recipes. This information is illustrated in Figure 8 above.

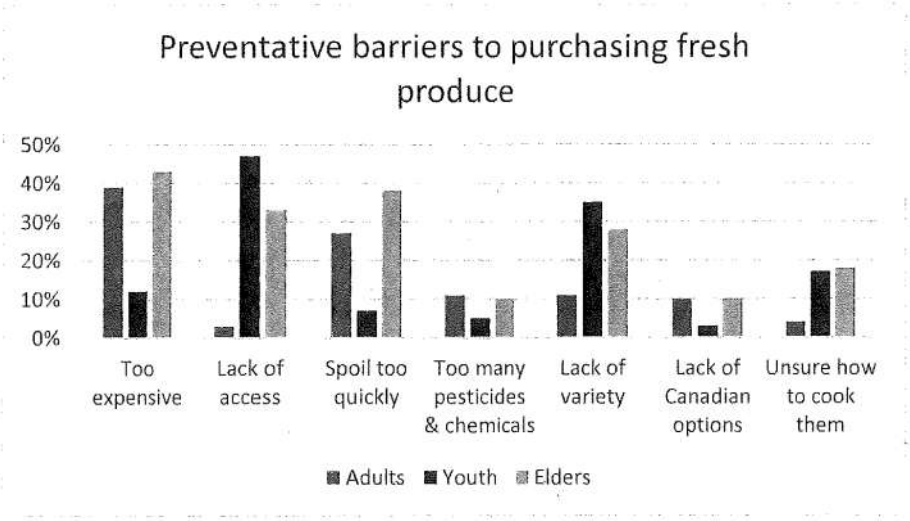


Figure 11 community engagement feedback identifying barriers to purchasing fresh produce

The diagram depicts their perspective barriers of purchasing fresh produce across the demographics.

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6.1.5 Elected Leadership: Three elected governments

- ✓ Opaskwayak Onekanew and Onuschekawak (Cree words for Chief and Council)
- ✓ Town of The Pas Mayor and Council
- ✓ Rural Municipality of Kelsey Reeve and Council
- ✓ Tri-Council project team

The three governments that form the Tri-Council are heavily engaged and very supportive of the challenge, each appointing a representative to serve on the working group as well as participating with the project team to make decisions, act as a liaison for their respective council and provide feedback. The Smart Cities Challenge is a standing agenda item for the Tri-Council, which meets quarterly. As a Tri-Council they agreed on the Challenge Statement and concurred that the issues being addressed within the proposed project are a priority for each of the communities.

Reports and updates are provided at each quarterly meeting, and each council has the opportunity to provide insight and engage in open discussions regarding the project, to make suggestions, and to assist with establishing the plan to move forward. Each of the three councils have individually passed resolutions to support and assist with sustaining our Smart Cities Challenge Statement in addition to passing resolutions as a Tri-Council. Resolution was passed by each council to support the submission of the original proposal on behalf of the Tri-Council to Smart Cities, resolutions were passed for a Funding Authorization Process which outlined the project committee members financial responsibility, and resolutions were passed to approve the hiring of the proposal manager and coordinator. The appointed representatives from each council are empowered by the resolutions to make decisions and provide approval when required. Each council receives updates from their respective representatives at least once a month during council meetings. These processes and approvals allow the working group to obtain quick authorization when decisions need to be made while maintaining open and steady communication with each of the councils.

6.1.6 Health Partners

- ✓ Northern Health Region/Opaskwayak Health Authority Joint Steering Committee
- ✓ Opaskwayak Health Authority Board of Directors
- ✓ Public Health Programs

The Northern Health Region (NHR) manages the hospital and clinics that provide health care services in the Town of The Pas that is funded by the provincial government. Opaskwayak Cree Nation manages and provides health services at the Beatrice Wilson Health Centre which is located on reserve territory and is funded by the federal government. The issues created by the jurisdictional policies and resource allocations have resulted in fractured health care service delivery that have historically not effectively met the needs of either jurisdiction. As a result, health leadership officials agreed that finding a better way to work together would be beneficial to all community members. As such, a Statement of Intent on collaboration on health services was signed by senior official between Opaskwayak Cree Nation and the Northern Health Region.

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The purpose, as written within the Statement of Intent, reads as follows:

OCN and NHR agree to have a written statement on their intention to work together in a continuing partnership on health care and health services delivered in the area. The vision for the collaboration is to develop and enhance programs between these entities and to agree to an ongoing commitment and process for developing programs and infrastructure management. The two service entities, working together with the existing authorities in the federal and provincial governments, will achieve improved health outcomes.

Representatives from OHA and NHR meet once a month as a joint steering committee on health at which issues on health care service and service delivery are discussed and solutions are created. This joining of forces is a significant factor in the anticipated effectiveness of the Continuous Glucose Monitoring technology study group. Ongoing engagement with participants and health care providers will play a significant role in supporting the participant study group, other community members wishing to address health issues such as diabetes and supporting evaluation of the impact of our project on our anticipated outcomes.

Opaskwayak Health Authority Board of Directors and leadership staff have acknowledged their support of the Smart Cities Challenge project. They have approved the formation of a continuous glucose monitoring study group for the purpose of diabetes research and approved OCN's Research Lens in Ethical Decision Making that has been developed by OCN for the purpose of diabetes Type II research and was completed by OHA staff for the purpose of this proposal. Additionally, they have recommended the creation of an integrated care team, consisting of a physician, registered nurse, medical and clinical assistants and social worker to specifically support the population living with diabetes. The team will be supported by a Learning Circle which pulls groups of people together who have common concerns or interests. The Learning Circles at Beatrice Wilson are also responsible to ensure that the cultural component which is integral to the guiding principles of OHA are incorporated into all teaching sessions.

The Northern Health Authority Board of Directors has similarly expressed their support for ongoing collaboration between the NHR and Opaskwayak and support the anticipated research and program expansion as we continue to work together to reduce jurisdictional issues and meet the issues addressed in our challenge statement. The Northern Health Region has also established and formalized an Indigenous Cultural Training program that involves staff from OHA at every training day. The impact of this is reflected in the program development between the two organizations.

The integrated care team works directly with the Northern Health Region Diabetes Education Resource (DER) team which consists of dieticians and registered nurses also working to support individuals living with diabetes. This team is part of the provincial health region's primary care division and works out of health offices in The Pas. The NHR supports the work that the DER team does at Beatrice Wilson and their work with the integrated care team. The fluidity of services provides the basis for citizens of the Tri-Council region to have the choice of accessing care in either The Pas or Opaskwayak and to have the basis of care remain consistent. Participants of the study group with the wearable technology will also have the option of attending either facility for supportive care and follow up. Mental health is also provided for all citizens, with alternate providers within a similar structure.

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The public health team provides educational opportunities throughout the Tri-council region offering lunch and learn opportunities, cooking classes and dietary counselling for anyone who requests. The food grown at the existing Vertical Smart Farm has already been introduced into the population over the past two years, and school education programs have been part of this effort. They have agreed that this form of support will continue and grow during the implementation phase.

6.2 Implementation Plan

We have found that community engagement serves as an effective tool for providing feedback on alignment between project outcomes and community expectations. Therefore, ongoing engagement with already established stakeholders as well as those that will be identified as the project progresses. Utilizing the engagement processes we have already completed, we will continue with a similar approach during the implementation phase as part of a feedback system to ensure our project is effectively meeting outcomes amongst our diverse population.

Ongoing feedback will identify the following information that can be provided by specific stakeholders and consumers.

6.2.1 General Population

Questions for all community members including those target groups listed below

- Consumption rates
- Awareness of relationship between diet and diabetes
- Smartphone distribution system effectiveness
- Study participation
- Product preference
- Overall satisfaction

6.2.2 Business Leadership

- Ordering, distribution of plant factory products
- Synergistic business opportunities – discussed below

6.2.3 Schools/Youth

articipation (with parental consent)
:e on families
nces for lunch programs

s with Disabilities

)ility of Smart Farm produce
:d foods – consideration in preparing, cutting, swallowing
use of Smartphone distribution system
:d options

including in project design

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6.2.5 Elders/seniors

- Accessibility of Smart Farm produce
- Project alignment with traditional values
- Project alignment with community values
- Project alignment with family values

6.2.6 Government Leadership

- Feedback from electorate
- Alignment with community priorities
- Potential synergies with other community development work

6.2.7 Health Partners

- Patient feedback
- Study group feedback
- Health professional feedback
- Public health feedback

6.3 Risk Identification and Mitigation

1. Competition with Local Farmers

   It is foreseeable that local farmers may feel the smart farm is in direct competition with their production. Mitigating this possibility will be done through collaboration. The growing season for local farmers is short. Therefore, the smart farm could schedule non-conflicting products during the season that farmers are selling their produce or offer farmers an opportunity to expand their market reach through project collaboration and leveraging the smartphone distribution system.

2. Competition with local businesses – grocery stores

   Local businesses have embraced the smart farm project; however, this position may chan[redacted] point during the implementation phase of the project. If this were to happen, mitigating s[redacted] would include:

   - Discussion regarding the possibility of using the smart farm as a supplier (considering distribution contracts that they may already hold with other suppliers)
   - Exploring potential business synergies or non-competing add-on products options eg meal kits that include fruits and vegetables from the smart farm with products such as rice, bread, pasta, condiments, and so forth from their own store

3. Smartphone operation challenges

   Smartphone operation familiarity may vary greatly amongst community members, so it is anticipated that some individuals may find it stressful adopting this ordering platform. Training sessions or tutorials can be offered for these individuals to teach them how to use the smartphone app. Additionally,

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instructional videos could be made available on the user-friendly website, offering step-by-step instructions, access produce, incentives and recipes.

Elders have indicated that their grandchildren assist them with their technology issues, so ensuring youth are familiar with operation of the smartphone application is important in reaching elders.

4. Unexpected technical issues

   Partnership with the OCN pilot Smart Farm provides the project team access to personnel experienced in the operation of the Smart Farm technology for troubleshooting potential issues with the Smart Farm. An ongoing relationship with the software development firm, as well as budgeting financial resources, will facilitate resolution of any major software issues that may arise.

5. Smartphone access

   The Smart Farm will have a website for online ordering so a computer can be used in place of a smartphone. In addition, we will also have a pickup location at the Smart Farm where community members can purchase fresh produce directly.

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7 CHAPTER 7: DATA AND PRIVACY

Our project team has worked in cooperation with officers of the Manitoba Ombudsman's Office to understand and ensure that our project meets the applicable data and privacy legislation regulations. It is the objective of the project that all legislation be followed to ensure protection of our community members' privacy and confidentiality.

The Manitoba Ombudsman's Office suggested we consider the following authorities in completing our data and privacy impact assessment, as well as provide us with their privacy impact assessment tool. The Manitoba Ombudsman's Office further suggest that we consider Fair Information Principles throughout this process. The data protection authorities that were considered in identifying the impacts of data security throughout this project include:

- The Personal Health Information Act (PHIA)
- The Freedom of Information and Protection of Privacy Act (FIPPA)
- The Personal Information Protection and Electronic Documents Act (PIPEDA)

We are grateful for the staff at the Manitoba Ombudsman's Office and for the Office of the Privacy Commissioner of Canada for their review and comments during the completion of the Preliminary Privacy Impact Assessment Tools that are required for this project. We have provided these documents under separate submission.

To identify information transaction, including collection and distribution, it is necessary to identify the legal entity with whom the transaction is taking place. The commercial activity detailed in this proposal occurs between the community members (customer) and the not-for-profit corporation (to be established in the implementation phase, detailed in Chapter 8, herein referred to as the NFP). *Figure 12* illustrates the information flow considerations of the overall project and differentiates personal information transactions between the customer and the NFP (and financial institution), and health information transactions between the biometric feedback study patient and the healthcare authority in blue and orange respectively. This diagram serves to clearly identify that customers' personal information provided to the NFP is not disclosed to the healthcare provider, and the health information provided to the healthcare provider is not disclosed to the NFP; the customer/study participant is the only common link between these two aspects of the project.

A further discussion about each of the data protection authorities is included below.

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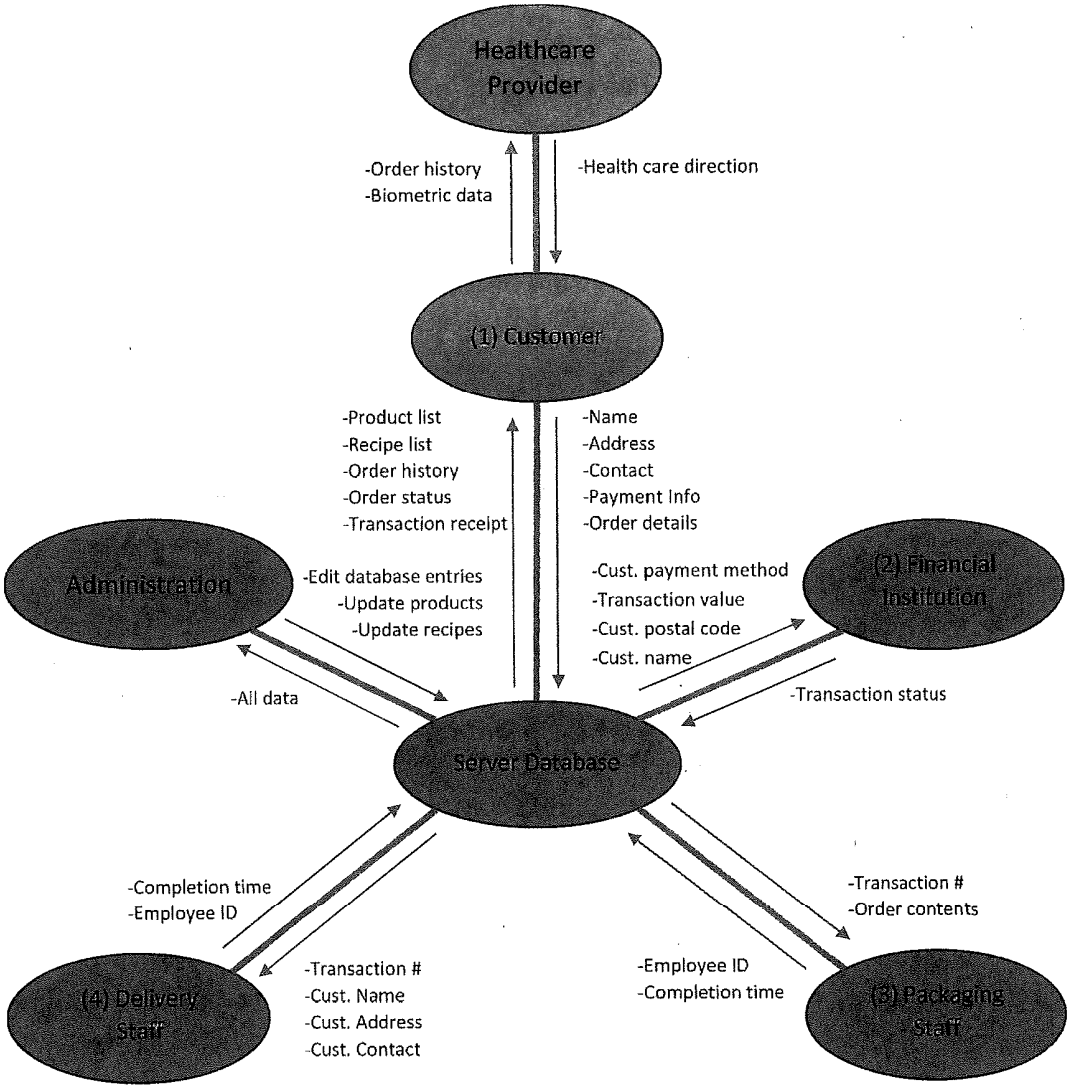


Figure 12 PIPEDA vs PHIA data

7.1 Consideration of Data Protection Authorities and Principles

7.1.1 The Personal Health Information Act (PHIA)

As per Manitoba legislation, PHIA provides access to information and protection of privacy rights concerning personal health information. PHIA allows individuals to examine and receive a copy of their own personal health information from a trustee holding this information. PHIA imposes obligations on trustees for the protection of personal health information, specifically its collection, use, disclosure and security. In our detailed analysis of the PHIA implications on this project, we will demonstrate that all personnel working with individuals in our health centre or performing research in any way that is related to this project, must always have completed PHIA training and signed agreement to maintain patient confidentiality. This applies to all records, information and conversations that have anything to do with personal health information of any sort.

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7.1.2 The Freedom of Information and Protection of Privacy Act (FIPPA)

Upon consultation with the Manitoba Ombudsman's Office and their review of this submission, they have concluded that the Manitoba public bodies associated with this project (RM of Kelsey and Town of The Pas) will not be engaged in the collection, use or disclosure of personal information subject to FIPPA. Therefore, consideration of the requirements of FIPPA to personal information associated with the project is not required.

7.1.3 The Personal Information Protection and Electronic Documents Act (PIPEDA)

As per federal regulation and the Office of the Privacy Commissioner of Canada, PIPEDA is the federal privacy law for private-sector organizations not otherwise subject to provincial legislation which are engaged in commercial activity. It determines how businesses must handle personal information in the course of the commercial activity. The business activities of the NFP includes the growing and selling of food at the Smart Farm. This commercial activity includes the collection of the individual's name, address, contact information, payment information and order details. This information is subject to PIPEDA. We have addressed the requirements of PIPEDA in our Privacy Impact Assessment and sought response and contribution from both the Province of Manitoba Ombudsman's Office and the Office of the Privacy Commissioner of Canada in assuring that we are legally and appropriately managing personal information associated with this business.

7.1.4 Fair Information Principles

The fair information principles, provided by the Manitoba Ombudsman's office for our use, have been considered in our business plan and will continue to be addressed as we proceed. These principles include:

- Be accountable
- Identify the purpose
- Obtain valid, informed consent
- Limit collection
- Limit use, disclosure and retention
- Be accurate
- Use appropriate safeguards
- Be open
- Give individuals access
- Provide individuals with an avenue for recourse

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7.2 Privacy Impact Assessment Tool

We have highlighted details of our plan for the collection, use and disclosure of information through completion of the Privacy Impact Assessment Tool (detailed below). We have identified how we plan to mitigate risks to the public as it pertains to the collection and use of their personal and personal health information as it relates to their interface with our planned project. As such, we have identified the following areas that must be considered:

- Data-minimization – we plan to collect, use and disclose only what is necessary for the customer to receive the goods and services that have identified as something they want and that they provide full consent for all information they share.
- De-identification – we plan to de-identify personal information wherever possible, such as package labelling using a QR code and utilizing a scanner to access information. Similarly, the health care follow-up and research will be done using the strict codes of ethics and research as established by the Canadian Institute for Health Research and the University of Manitoba, which includes de-identification as much as possible as well as early destruction of information collected when its use has expired. Additionally, this is only done with the individual's full knowledge and consent.
- Opt-out strategy – individuals may opt out of doing business with the Smart Farm at any time. Options for doing so may be that they opt-out of paying with a credit card and simply use an alternative such as preloading their account with cash at the Smart Farm. Alternatively, they may cancel their account with the business at any time. For financial reasons, the business must keep record of any financial transactions for seven years, but any personal information is deleted.
- Data governance and Privacy Management program – our proposed business will be supported by a policy that ensures the administrator of the data required to operate the business of the Smart Farm and delivery system is aware and compliant with PIPEDA and the importance of the confidentiality that each customer requires and can be ensured of receiving from the business regarding their information. The administrator will be the privacy lead and will report to the CEO or the business, who in turn reports to the Board of Directors of the business regarding auditing and compliance as well as managing breach of compliance. This will be supported by the policy. There are no other partners to consider as any other entities associated with the business are vendors and accessing their technology will also require agreements and conditions that support current legislation and controls.

  All health care data is protected by the personal health information legislation. Two health clinics will be utilized for the purpose of working with and supporting individuals who wish to be participants in the study group. One health clinic, Beatrice Wilson Health Centre, is operated by Opaskwayak Health Authority. The other clinic, The Pas Primary Care Clinic, is located within The Pas Health Complex in The Town of The Pas and is operated by the provincial Northern Regional Health Region. Both clinics follow the PHIA legislation and all staff have received PHIA training and have signed agreements of confidentiality under this legislation. All personal health information is

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stored on an electronic medical record, Accuro, and the data is shared between the two sites. The Northern Regional Health Authority is the trustee of this data. Each of the clinics has a privacy officer, responsible for maintaining confidentiality, auditing, and to whom individuals may go to regarding concerns or any real or perceived breaches of their confidentiality that they wish to discuss.

- Community engagement and project transparency – we have completed comprehensive community engagement strategies including:
  - Surveys – business and general population
  - Forums – special needs groups, business, leadership, health
  - Social media – Facebook
  - Scheduled feedback - groups that hold regular meetings and include Smart Cities on their agenda including governments, business, health, Boards
  - Focus groups – people living with diabetes, disabilities, high risk youth, elders

  No privacy concerns were raised by users, residents, community members or other stakeholders during the community engagement process.
- Consent – individual consent is built into every step of our proposed project. Consent is necessary to access the server database of our business so that the individual may order and pay for food from the Smart Farm and have it delivered to their door. They may also access food by driving to the Smart Farm and ordering it directly and paying for it in any method they choose, so it is not that this food is inaccessible if they do not provide personal information. Consent is also required if individual's wish to participate in the study or research project associated with our proposal. All information shared by the individual at the health clinic's is covered by PHIA and consent of patients under that legislation.

7.3 PIPEDA Preliminary Privacy Impact Assessment

The NFP provides food production and distribution services to customers. Customers are able to purchase food products in two different ways from the NFP; pickup in person at the NFP business location, or delivery-to-door service through the smartphone application. Pickup of food products at the NFP business location in person does not require the collection of any personal information. However, customer's personal information must be collected by the NFP for the provision of food delivery services. Interaction between the NFP and the customer begins with the customer's downloading of the smartphone application.

Upon downloading the smartphone application used for placement of order to the NFP, customers will be required to create an account before they can access information and resources provided by the application. Creation of an account will involve the **collection** of personal information and is thus subject to PIPEDA considerations. The minimal amount of personal information needed in order to effectively deliver services will be collected.

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Personal information items that will be collected by the application include:

- Name
- Address
- Contact information
- Payment information
- Order details

This information will be **used** by the NFP for internal business operations including:

- Packaging identification
- Product identification
- Location of order delivery

Information will only be provided to employees of the NFP on a need to know basis, in further pursuit of compliance with PIPEDA. This data will be re-used every time the customer places an order to minimize the number of steps that must be takes to place a food order; the easier it is to order food the higher probability this procurement path will be take and consequently the greater the impact on health.

There are two methods that will be available to customers for processing payment; credit card or preloaded account balance. Preloading of the customer's account can occur by depositing cash or cheque at the plant factory. However, processing of credit card payments requires the **disclosure** of personal information to the financial institution in order to process the transaction.

It is understood that any personal information **collection** or **disclosure** event must solicit the express consent of the customer in order to ensure compliance with PIPEDA legislation.

*Figure 13*Figure 13 below illustrates the data flow between the customer (green), NFP (blue), and financial institution (yellow); data collection and disclosure events are highlighted with red arrows. In pursuit of compliance with this legislation, a notice of data collection window will be displayed to the customer upon prompting the creation of an account with the NFP and must be agreed to prior to submission of any personal data. Secondly, a notice of disclosure window will be displayed, and must be acknowledged by the customer, prior to processing any transaction via credit card to ensure informed consent regarding NFP's required **disclosure** of personal information to perform this activity.

Customers will, at any time, be able to delete their account with the NFP through the smartphone application interface, thus deleting the existence of their personal information from the customer database. However, in compliance with financial legislation, there will be a record kept of any purchase transactions that the customer processed with the NFP. Furthermore, under PIPEDA legislation, customers have the right to request a copy of their personal information or request a correction of this information held by a business entity at any time. This will be observed by the following two measures:

1. Customers have 24-hour access to their personal information held on the NFP server through the smartphone application
2. Customers can contact the manager of the NFP in order to access their personal information

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The smartphone application required for this project currently does not exist. Therefore, a software development contractor will be hired for the purposes of creating the required software solution. Furthermore, this company may be used from time to time to provide application updates to ensure compatibility with future operating system releases or to increase/modify features incorporated into the smartphone application. However, there is no anticipated disclosure of personal information through this process. To make this delineation clear, the following is a brief overview of the software architecture.

The smartphone application software will operates using three components:

- A frontend application
- A backend application
- An information database

The frontend application is the smartphone application that customers will download and run on their smartphone. This application will be placed on the Android Play store and the Apple Store so that it is easily accessed by all who desire to use the services of the NFP. The backend application resides on a server that will be located on the NFP business premises. The frontend application communicates with the backend application over the internet. The function of this backend application is to process commands and translate/organize information stored within the database so that it is correctly displayed on the smartphone application. To ensure data security at the place of residence, user information will be encrypted on the server hard-drive. To ensure data security within all internet-based communication links, industry standard TLS encryption will be used.

The software developer will create the code for the frontend application, the backend application, and the framework for the information database. During the development of these codes, or during the updating of these codes at a future date, the software developer does not require access to the database, they only require access to the frontend application and/or the backend application. Consequently, there is no disclosure of personal information to this third party at any time.

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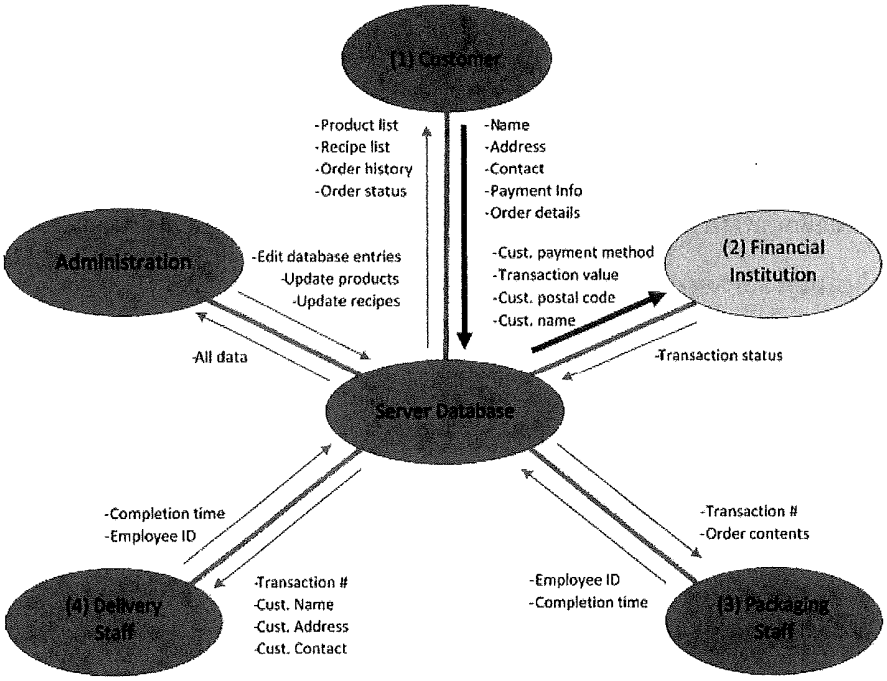


Figure 13 personal information flow diagram

Personal Information Collection and Disclosure Notice Statements

A notice of personal information collection statement must be agreed to by the customer prior to the NFP's collection of personal information. This statement will be displayed when the customer initiates account creation within the NFP's smartphone application. An example of a notice of personal information collection statement is:

By continuing with the creation of an account with the NFP corporation, you are agreeing to the collection and use of your personal information for the purposes of providing the services that the NFP corporation is offering.

A notice of personal information disclosure statement must be agreed to by the customer prior to the processing of payments for food products offered by the NFP. This statement will be displayed every time the customer initiates payment using a credit card as this requires disclosure of personal information to the financial institution. An example of a notice of personal information disclosure statement is:

By continuing, you understand and agree that your Name and Postal code will be disclosed to the financial institution for the purposes of processing the transaction.

7.4 PHIA Preliminary Privacy Impact Assessment

Health care professionals working at the Health Canada accredited health clinics will have access to study participant health information via the electronic medical record (EMR) which will be utilized to enrol and

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follow the study participants. The EMR utilized in the region is Accuro, which is one of the EMR system approved for use by Manitoba eHealth.

All health care data is protected by the PHIA legislation that governs personal health information.

Two health clinics will be utilized for the purpose of working with and supporting individuals who wish to be participants in the study group. One health clinic, Beatrice Wilson Health Centre, is operated by Opaskwayak Health Authority. The other clinic, The Pas Primary Care Clinic, is located within The Pas Health Complex in The Town of The Pas and is operated by the provincial Northern Regional Health Region. Both clinics follow the PHIA legislation and all staff have received PHIA training and have signed agreements of confidentiality under this legislation. All patient data is stored on an electronic medical record, Accuro, and the data is shared between the two sites. **The Northern Regional Health Authority is the trustee of this data.** Opaskwayak Health Authority has signed a Privacy Impact Agreement with the Northern Regional Health Authority (NRHA) which includes a Privacy Impact Assessment compliance document that was jointly signed at the time that Accuro was first shared by the NRHA with Opaskwayak Health Authority. Each of the clinics has a privacy officer, responsible for maintaining confidentiality, auditing, and to whom individuals may go to regarding concerns or any real or perceived breaches of their confidentiality that they wish to discuss.

The PHIA information flow map, shown below in Figure 14, outlines the collection, use and disclosure of personal health information, with the corresponding PHIA article numbers which govern the information's use.

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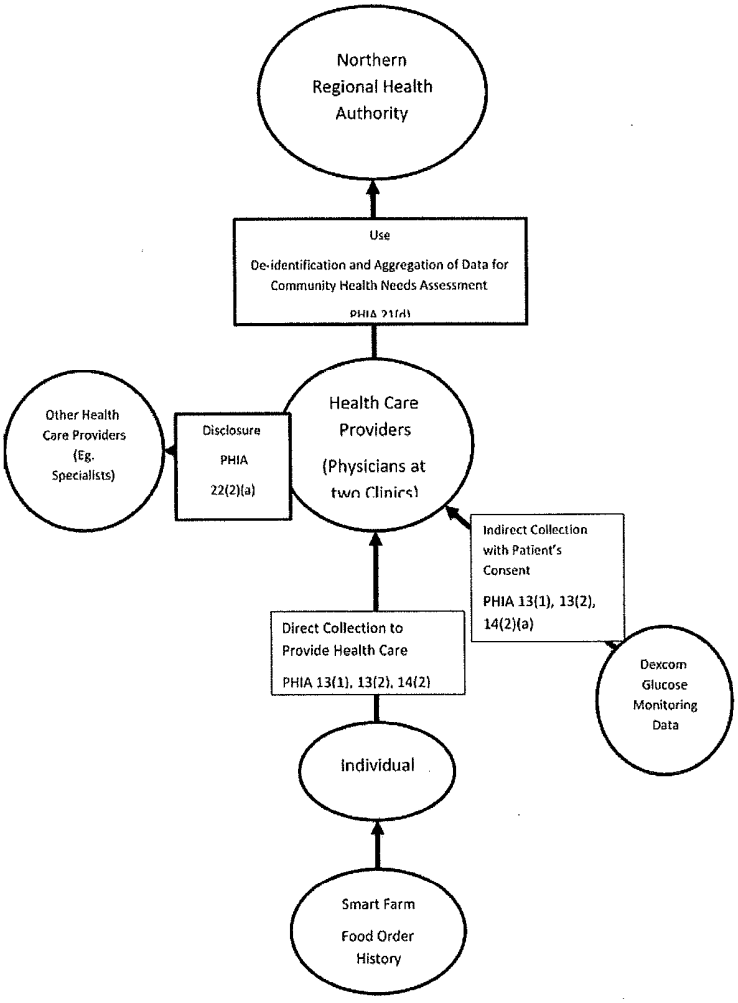


Figure 14 PHIA information flow map

7.4.1 Categories of personal (health) information to be collected, used and/or disclosed

Information collected by the healthcare clinics generally includes:

- name
- address
- contact information
- age
- sex
- allergies
- medications
- marital status
- medical history
- current health status
- other information as per current best practice in health care delivery

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Additionally, the biometric feedback study participants will provide data from their smart phone that has captured biometric data from their wearable device and their dietary choices. Any person in the community can healthcare without being participants in the study group. The intended use of the study is to demonstrate the connection between dietary choices and diabetes. It is our intention to respond to the growing diabetes epidemic in our community by demonstrating, through the use of data, that we can impact our health in a positive way through dietary choices.

Personal health information is collected and used for the individual's health as per PHIA and best practice standards of the nursing and medical professionals and their code of conduct within the primary care clinics.

7.4.2 Authority for the collection, use and disclosure of personal (health) information

For participation in the biometric feedback study group, customers will become patients of one of two clinics and their information will be kept secure through PHIA and the information sharing agreement for the electronic medical record (EMR). The researcher will have everyone in the study group sign a consent form which includes risk, benefits, all data collected and storage of data.

Data collected from the continuous glucose monitoring device, manufactured by Dexcom, will be sharable with the healthcare provider through Dexcom's proprietary Clarity software. Dexcom provides secure, cloud based, storage of user data using AES-256 encryption and data transmission encryption using a minimum of TLS 1.1. Dexcom operates under the U.S. Health Insurance Portability and Accountability Act (HIPPA) of 1996. Authorization for use of the Dexcom hardware and software has been provided by Health Canada as these devices are readily available to anyone in Canada.

PHIA defines **"personal health information"** as recorded information about an identifiable individual that relates to

a) the individual's health, or health care history, including genetic information about the individual,

b) the provision of health care to the individual, or

c) payment for health care provided to the individual, and includes

d) the PHIN and any other identifying number, symbol or particular assigned to an individual, and

e) any identifying information about the individual that is collected in the course of, and is incidental to, the provision of health care or payment for health care;

The project will involve personal health information (PHI), including:

- demographic information
- health information related to the provision of health care to the individual
- biometric data from diabetes glucose monitoring device
- order history of food from the smart farm

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7.4.2.1 Trustee

Under PHIA **"trustee"** means a health professional, health care facility, public body, or health services agency that collects or maintains personal health information.

The Northern Health Region is identified as the trustee for the purposes of this project. The personal health information will be collected by physicians (health professional) at medical clinics (health care facility). The Pas Primary Care Clinic (health care facility) and the Northern Health Region (public body) are both trustees. The Pas Primary Care Clinic is operated by the Northern Health Region, and the Region would also be considered the "trustee" of the PHI collected at the Clinic as the Region would "maintain" the PHI. The physicians at Beatrice Wilson Health Centre, OCN (operated by the Opaskwayak Health Authority) are contracted by the Northern Health Region and may be considered employees of the Region.

7.4.2.2 Collection

Personal health information to be collected includes information about an individual's health status and diabetes management and information about their food order history and glucose monitoring information relating to management of diabetes. Collection of personal health information will be for the purpose of providing health care to the individuals. The following provisions of PHIA provide authority for the collection of personal health information in these circumstances:

> **Restrictions on collection**
>
> **13(1)** A trustee shall not collect personal health information about an individual unless
>
> (a) the information is collected for a lawful purpose connected with a function or activity of the trustee; and
>
> (b) the collection of the information is necessary for that purpose.
>
> **Limit on amount of information collected**
>
> **13(2)** A trustee shall collect only as much personal health information about an individual as is reasonably necessary to accomplish the purpose for which it is collected.

7.4.2.3 Use

Use of the personal health information by health care providers at the clinics will be for the purpose of providing health care to the individual including to monitor and manage the health and diabetes of the individual, which is the purpose for which it was collected (s. 21 of PHIA). Anonymized and aggregated health information will be used by the Northern Health Region to conduct its community health needs assessment (project participants' health information will be included with all community members' health information) (s. 21(d) of PHIA). The following provision of PHIA provides authority for the use of PHI in these circumstances:

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7.4.2.3.1 Restrictions on use of information

21 A trustee may use personal health information only for the purpose for which it was collected or received, and shall not use it for any other purpose, unless

(a) the other purpose is directly related to the purpose for which the personal health information was collected or received;

(d) the trustee is a public body, or a health care facility, and the personal health information is used

(i) to deliver, monitor or evaluate a program that relates to the provision of health care or payment for health care by the trustee, or

(ii) for research and planning that relates to the provision of health care or payment for health care by the trustee;

Limit on amount of information used or disclosed

20(2) Every use and disclosure by a trustee of personal health information must be limited to the minimum amount of information necessary to accomplish the purpose for which it is used or disclosed.

7.4.2.4 Disclosure

Disclosure of the personal health information would be authorized for the following purposes:

- Disclosure for a health care purpose to a person who is or will be providing or has provided health care to the individual (s. 22(2)(a) of PHIA)
- Disclosure with the consent of the individual (s. 22(1)(b) of PHIA)
- Disclosure to a researcher at University of Manitoba to conduct research with de-identified health information (s. 22(2)(f) and 24 of PHIA)

The disclosure of personal health information in the circumstances as noted above is authorized under the following provisions of PHIA:

Individual's consent to disclosure

22(1) Except as permitted by subsection (2), a trustee may disclose personal health information only if

(b) the individual the information is about has consented to the disclosure.

Disclosure without individual's consent

22(2) A trustee may disclose personal health information without the consent of the individual the information is about if the disclosure is

(a) to a person who is or will be providing or has provided health care to the individual, to the extent necessary to provide health care to the individual, unless the individual has instructed the trustee not to make the disclosure;

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(f) in accordance with subsection 22(2.2) (disclosure to another government), section 23 (disclosure to patient's family), section 23.1 (disclosure to religious organization), section 23.2 (disclosure for fundraising), section 24 or 24.1 (disclosure for health research) or section 25 (disclosure to an information manager);

7.4.2.4.1 Disclosure for health research

24(1) A trustee may disclose personal health information to a person conducting health research if the research has been approved under this section.

Who may give an approval?

24(2) An approval may be given by

(a) the health information privacy committee established under section 59, if the personal health information is maintained by the government or a government agency; and

(b) an institutional research review committee, if the personal health information is maintained by a trustee other than the government or a government agency.

Conditions for approval

24(3) An approval may be given under this section only if the health information privacy committee or the institutional research review committee, as the case may be, has determined that

(a) the research is of sufficient importance to outweigh the intrusion into privacy that would result from the disclosure of personal health information;

(b) the research purpose cannot reasonably be accomplished unless the personal health information is provided in a form that identifies or may identify individuals;

(c) it is unreasonable or impractical for the person proposing the research to obtain consent from the individuals the personal health information is about; and

(d) the research proposal contains

(i) reasonable safeguards to protect the confidentiality and security of the personal health information, and

(ii) procedures to destroy or remove, at the earliest opportunity consistent with the purposes of the research, any information that, either by itself or when combined with other information available to the holder, allows individuals to be readily identified.

7.4.3 Agreement required

24(4) An approval under this section is conditional on the person proposing the research project entering into an agreement with the trustee, in accordance with the regulations, in which the person agrees

(a) not to publish the personal health information requested in a form that could reasonably be expected to identify the individuals concerned;

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(b) to use the personal health information requested solely for the purposes of the approved research project; and

(c) to ensure that the research project complies with the safeguards and procedures described in clause (3)(d).

7.4.4 Source and accuracy of personal (health) information

Source of information

14(1) Whenever possible, a trustee shall collect personal health information directly from the individual the information is about.

Exceptions

14(2) Subsection (1) does not apply if

(a) the individual has authorized another method of collection;

For the purposes of our project, personal health information is obtained directly from the individual and not from a family member or another RHA or government department. Patients will provide their food order history data and their glucose monitoring information gathered by their wearable device that is stored on their smart phone to their health care provider (if glucose monitoring data is not collected directly from the patient, the collection from another source (Dexcom) may be authorized by the patient (s.14(2)(a) of PHIA).

7.4.5 Notification statements

Notice of collection is required under s. 15(1) and (2) of PHIA:

Notice of collection practices

15(1) A trustee who collects personal health information directly from the individual the information is about shall, before it is collected or as soon as practicable afterwards, take reasonable steps to inform the individual

(a) of the purpose for which the information is being collected; and

(b) if the trustee is not a health professional, how to contact an officer or employee of the trustee who can answer the individual's questions about the collection.

Exception if information already provided

15(2) A trustee need not comply with subsection (1) if the trustee has recently provided the individual with the information referred to in that subsection about the collection of the same or similar personal health information for the same or a related purpose.

Personal Health Information Disclosure Statement:

As part of receiving or providing health care services at a site within the Northern Health Region; we only collect, use and disclose your personal information and personal health information as permitted by The

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Personal Health Information Act (PHIA) and The Freedom of Information and Protection of Privacy Act (FIPPA). These Acts require Northern Health Region to protect the privacy of your information.

7.5 Risk Identification and Mitigation

One of the risks associated with the collection of any type of data is that it becomes compromised through a security breach. It is generally accepted that proper encryption techniques, both for the transmission and storage of this data, are suitable measures for mitigating this risk.

Inappropriate access to information, by employees of the organization that holds the information, is another mechanism whereby personal information security can be breached. This can take place with both personal information and personal health information. Implementation and enforcement of policies and procedures which outline the access to information on a need-to-know basis are understood to be the most effective methods for mitigating this risk.

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8 CHAPTER 8: FINANCIAL

We have created a budget that reflects the four milestones of our project as per our performance-based outcomes measurement plan discussed in Chapter 2 and the project management plan discussed in Chapter 3. As outlined in these Chapters, we propose four reporting periods over five years, in which all activities associated with that reporting period are met, as the framework for our outcomes-based contribution plan. Release of installment payments are anticipated to occur following the successful review by Infrastructure Canada of milestone reports; the reports outlined in Chapter 2. The budget reflects a comprehensive detailed breakdown of costs associated with implementation of the project.

The implementation process for this project breaks down the development of each of the three critical levers, identified in Chapter 1, and divides them into two stages of development: **building** and **operating**. The project budget breakdown reflects this approach; building costs and operating costs are assigned to each of the project lever categories.

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8.1 Summary Project Budget

Overall Project *Project Budget*		$ 9,990,399.57	*Installment 1* *$ 6,224,777.11*	*Installment 2* *$ 1,112,069.83*	*Installment 3* *$ 2,413,637.83*	*Installment 4* *$ 239,914.80*
General *Budget Summary*			*Installment 1* *$ 340,200.00*	*Installment 2* *$ 127,575.00*	*Installment 3* *$ 402,675.00*	*Installment 4* *$ 85,050.00*
General						
General Costs ($)			$ 300,000.00	$ 112,500.00	$ 362,500.00	$ 75,000.00
Total Costs ($)			**$ 324,000.00**	**$ 121,500.00**	**$ 383,500.00**	**$ 81,000.00**
Buffer	*5%*		*$ 16,200.00*	*$ 6,075.00*	*$ 19,175.00*	*$ 4,050.00*
Total Budget - General ($)			***$ 340,200.00***	***$ 127,575.00***	***$ 402,675.00***	***$ 85,050.00***
Smart Farm *Budget Summary*			*Installment 1* *$ 5,252,270.34*	*Installment 2* *$ 706,401.37*	*Installment 3* *$ 419,332.30*	*Installment 4* *$ 58,152.97*
GENERAL COSTS						
Electricity Costs ($)			$ 79,873.05	$ 50,639.41	$ 172,579.21	$ 59,110.51
Water Cost ($)			$ 306.96	$ 2,953.04	$ 15,977.48	$ 5,981.32
Rent Cost ($)			$ 256,666.67	$ 105,000.00	$ 245,000.00	$ 70,000.00
BUILDING COSTS						
Preparation Costs ($)			$ 1,175,200.00	$ -	$ -	$ -
Equipment Costs ($)			$ 3,017,194.92	$ -	$ -	$ -
OPERATING COSTS						
Consumables Costs ($)			$ -	$ 92,519.61	$ 447,658.51	$ 150,451.92
Miscellaneous Costs ($)			$ 37,950.00	$ 20,900.00	$ 44,500.00	$ 5,400.00
Labour Costs ($)			$ -	$ 342,250.00	$ 1,314,250.00	$ 426,500.00
Total Costs ($)			**$ 4,567,191.60**	**$ 614,262.06**	**$ 2,239,965.19**	**$ 717,443.75**
INCOME						
Production Income ($)			$ -	$ -	$ 2,156,627.67	$ 766,907.34
Total Income ($)			**$ -**	**$ -**	**$ 2,156,627.67**	**$ 766,907.34**
Buffer	*15%*		*$ 685,078.74*	*$ 92,139.31*	*$ 335,994.78*	*$ 107,616.56*
TOTAL BUDGET - Smart Farm ($)			***$ 5,252,270.34***	***$ 706,401.37***	***$ 419,332.30***	***$ 58,152.97***
Smartphone Distribution System Costs *Budget Summary*			*Installment 1* *$ 632,306.77*	*Installment 2* *$ 105,593.46*	*Installment 3* *$ 478,179.80*	*Installment 4* *$ 96,711.83*
Building Costs						
Equipment Costs ($)			$ 267,478.80	$ -	$ 108,640.00	$ -
Software Development Total ($)			$ 282,500.00	$ 28,250.00	$ 56,500.00	$ -
Operating Costs						
Vehicles Costs ($)			$ -	$ 3,979.51	$ 18,149.42	$ 5,513.98
Labour Costs ($)			$ -	$ 60,000.00	$ 233,333.33	$ 80,000.00
Total Costs ($)			**$ 549,978.80**	**$ 92,229.51**	**$ 416,622.76**	**$ 85,513.98**
Income						
Charging Station Income ($)			$ 198.65	$ 553.50	$ 1,101.61	$ 1,916.76
Total Income($)			**$ 198.65**	**$ 553.50**	**$ 1,101.61**	**$ 1,916.76**
Buffer	*15%*		*$ 82,526.62*	*$ 13,917.45*	*$ 62,658.65*	*$ 13,114.61*
TOTAL BUDGET - Smartphone Distribution System($)			***$ 632,306.77***	***$ 105,593.46***	***$ 478,179.80***	***$ 96,711.83***
Biometric Feedback Study *Budget Summary*			*Installment 1* *$ -*	*Installment 2* *$ 172,500.00*	*Installment 3* *$ 1,113,450.73*	*Installment 4* *$ -*
Implementation Costs						
Equipment Costs ($)			$ -	$ -	$ 331,171.36	$ -
Operating Costs ($)			$ -	$ 150,000.00	$ 637,046.67	$ -
Total Costs ($)			**$ -**	**$ 150,000.00**	**$ 968,218.03**	**$ -**
Buffer	*15%*		*$ -*	*$ 22,500.00*	*$ 145,232.70*	*$ -*
TOTAL BUDGET - Biometric Study ($)			***$ -***	***$ 172,500.00***	***$ 1,113,450.73***	***$ -***

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8.2 Comprehensive Project Budget

8.2.1 Budget Timeline

The budget has been developed around an outcomes-based contribution model. As such, the each of the four financial installments identified in this chapter, are directly associated with completion of project milestones. Milestone reports will be submitted to Infrastructure Canada upon completion of the outcomes identified in Chapter 2. The estimated date of report submission are identified in the project financial schedule in *Figure 15* below with red diamonds. Ten weeks has been provided allotted for milestone report review by Infrastructure Canada, with the anticipated release of the subsequent funding installment following that review.

A complete Gantt chart, including the information below along with corresponding project activities and tasks can be found in Chapter 3.

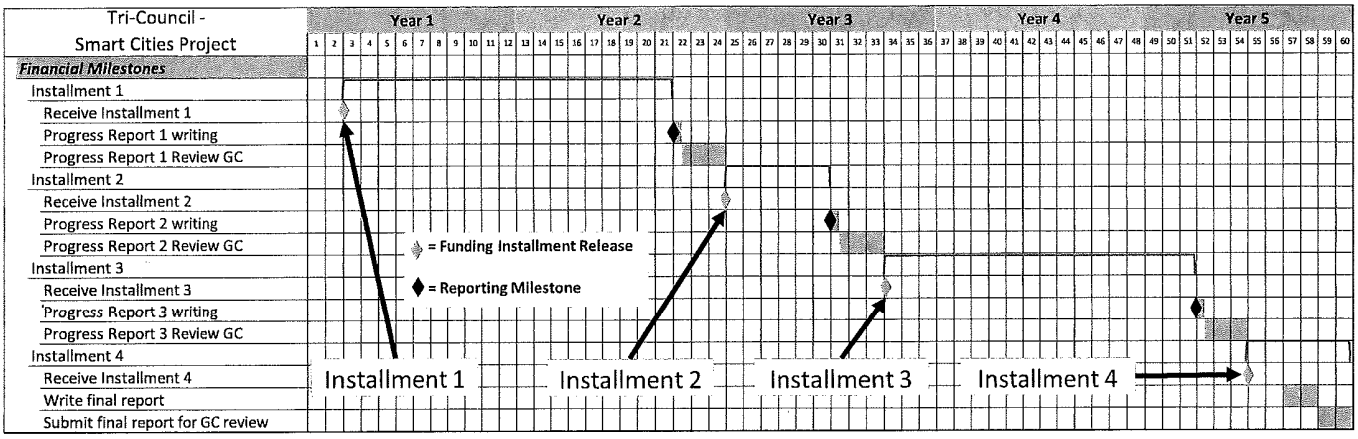


Figure 15 project funding timeline

The following sections present detailed budgets for each of the three main project activities; the Smart Farm, smartphone distribution system, and biometric feedback study. Each of these activities is then broken down into two stages; building and operating. Furthermore, each of these stages, within each activity, is broken down to a list of equipment expenses and labour expenses (hard expenses and soft expenses). There are several general costs that are associated with project management and overall project implementation and those are capture in the general operations section below.

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8.2.2 General Operations Budget

The general operating budget includes items that are associated with project management and overall project implementation. This portion of the budget is included below in *Figure 16*.

A general manager will be needed to act as a coordinator for all activities included in the project. This individual will be responsible for coordinating project tasks and procurement, hiring staff, and writing milestone reports for Infrastructure Canada. It is anticipated that this person will have to travel from time to time, and so a travel budget is additionally included in the budget to accommodate these expenses as they arrive.

A community engagement coordinator will be needed from time to time throughout the implementation of the project to coordinate community engagement activities. A budget to cover their time is also included here. Those activities will include those listed in Chapter 6 and will be pertinent to the successful implementation of the project.

A community health needs assessment report was produced by The Pas and OCN in 2017-2018. The cost of that report was covered by the provincial government for The Pas and Kelsey; however, given that OCN does not fall within provincial jurisdiction, the cost of developing that report for the population of OCN was covered by the OCN band. The cost of this report was roughly $100,000. In order to ensure that an equivalent report is produced upon completion of the implementation phase, this amount has been added to the budget as it is a necessary piece of data required to accurately assess the effectiveness of the project in decreasing diabetes rates in the region.

General

Budget Summary				*Installment 1*	*Installment 2*	*Installment 3*	*Installment 4*
				$ 340,200.00	*$ 127,575.00*	*$ 402,675.00*	*$ 85,050.00*
General							
General							
Category	**Value**	**Units**	**Qty**	**Installment 1**	**Installment 2**	**Installment 3**	**Installment 4**
Travel for meetings	$ 40,000.00	/year		$ 80,000.00	$ 30,000.00	$ 70,000.00	$ 20,000.00
General Project Manager	$ 110,000.00	/year		$ 220,000.00	$ 82,500.00	$ 192,500.00	$ 55,000.00
Community Engagement Coordinator	$ 12,000.00						
Health Needs Assessment Report Contribution	$ 100,000.00			$ -	$ -	$ 100,000.00	$ -
General Costs ($)				$ 300,000.00	$ 112,500.00	$ 362,500.00	$ 75,000.00
Total Costs ($)				***$ 324,000.00***	***$ 121,500.00***	***$ 383,500.00***	***$ 81,000.00***
Buffer	*5%*			*$ 16,200.00*	*$ 6,075.00*	*$ 19,175.00*	*$ 4,050.00*
Total Budget - General ($)				***$ 340,200.00***	***$ 127,575.00***	***$ 402,675.00***	***$ 85,050.00***

Figure 16 general project budget

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8.2.3 Smart Farm Budget

The following budget, *Figure 17*, is a complete budget for the Smart Farm, presented in two activity categories, building and operating, and further broken down to a list of equipment expenses and labour expenses (hard expenses and soft expenses). Detailed descriptions follow.

Smart Farm

Budget Summary

	Installment 1	*Installment 2*	*Installment 3*	*Installment 4*
	##########	*$ 706,401.37*	*$ 419,332.30*	*$ 58,152.97*
Growing Space (ramp up to full production expected)	Year 1	Year 2	Year 3	Year 4
Active growing units	0	21	41	48
Active grow beds	0	84	164	192
Square ft grow space	0	9,148	17,860	20,909

GENERAL COSTS

Energy Use

Category	Value	Units	Qty	Installment 1	Installment 2	Installment 3	Installment 4
Lights Energy Use (kw*h)				0	239,206	1,076,429	358,810
Air Conditioner (kw*h)				0	84,096	378,432	126,144
Nutrients (kw*h)				0	23,635	106,356	35,452
Misc (kw*h)				1,425,705	534,639	1,247,492	356,426
Total Energy Use (kw*h)				1,425,705	881,576	2,808,709	876,832
Electricity Cost							
Basic Electricity Cost ($)				$ 356.40	$ 388.48	$ 420.55	$ 452.63
First 11,000 kwh/month ($/kw*h)				$ 0.09	$ 0.10	$ 0.10	$ 0.11
Next 8,500 kwh/month ($/kw*h)				$ 0.06	$ 0.07	$ 0.07	$ 0.08
Additional kwh/month ($/kw*h)				$ 0.04	$ 0.04	$ 0.05	$ 0.05
Electricity Costs ($)				$ 79,873.05	$ 50,639.41	$ 172,579.21	$ 59,110.51

Water Use

Category	Value	Units	Qty	Installment 1	Installment 2	Installment 3	Installment 4
Total water in beds (gallons)		250 L/bed		0	50,526	227,368	75,789
Water Use per harvest (gallons/harvest)		500% consumed / harvest		0	252,632	1,136,842	378,947
Water Use per month (gallons/month)		10 harvests/year (average)		0	210,526	947,368	315,789
Water Cost							
Service Charge (quarterly rate)				$ 34.27	$ 42.47	$ 52.63	$ 65.23
Service Charge (annual)				$ 137.08	$ 169.88	$ 210.53	$ 260.90
First 20,000 gallons ($/1,000 gallons)				$ 11.71	$ 11.75	$ 11.78	$ 11.82
Over 20,000 gallons ($/1,000 gallons)				$ 9.93	$ 11.74	$ 13.87	$ 16.40
Water Cost ($)				$ 306.96	$ 2,953.04	$ 15,977.48	$ 5,981.32

Rent

Item	Value	Units	Qty	Installment 1	Installment 2	Installment 3	Installment 4
Rental of space in Otineka mall	$ 140,000.00	/year		$ 256,666.67	$ 105,000.00	$ 245,000.00	$ 70,000.00
Rent Cost ($)				$ 256,666.67	$ 105,000.00	$ 245,000.00	$ 70,000.00

BUILDING COSTS

Preparation

Category	Value	Units	Qty	Installment 1	Installment 2	Installment 3	Installment 4
Renovations							
Construction Drawings	$ 30,000.00			$ 30,000.00	$ -	$ -	$ -
Procurment (building supplies)	$ 400,000.00			$ 400,000.00	$ -	$ -	$ -
Construction	$ 400,000.00			$ 400,000.00	$ -	$ -	$ -
Central Vacuum	$ 10,000.00			$ 10,000.00	$ -	$ -	$ -
Lockers, shelving, boot racks for staff	$ 10,000.00			$ 10,000.00	$ -	$ -	$ -
Fixture (counters, sinks, coolers, tables)	$ 105,000.00			$ 105,000.00	$ -	$ -	$ -
Completion	$ 50,000.00			$ 50,000.00	$ -	$ -	$ -
Security Camera system	$ 35,000.00	/system		$ 35,000.00	$ -	0	0
Preparation Costs Subtotal ($)				$ 1,040,000.00	$ -	$ -	$ -
GST				*$ 52,000.00*	$ -	$ -	$ -
PST				*$ 83,200.00*	$ -	$ -	$ -
Preparation Costs ($)				$ 1,175,200.00	$ -	$ -	$ -

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Equipment

Category	Value	Units	Qty	Installment 1	Installment 2	Installment 3	Installment 4
Smart Farm System Cost (terms 50% down, 40% on arrival, 10% aft. training)						$ -	
Electrical system	$ 33,000.00	/each	1	$ 33,000.00	$ -	0	0
Physical Structure	$ 6,500.00	/each	48	$ 312,000.00	$ -	0	0
Environmental System	$ 4,000.00	/each	4	$ 16,000.00	$ -	0	0
Lighting System	$ 300.00	/each	3072	$ 921,600.00	$ -	0	0
Nutrient System	$ 100,000.00	/each	4	$ 400,000.00	$ -	0	0
Control System	$ 9,500.00	/each	4	$ 38,000.00	$ -	0	0
HVAC System	$ 39,000.00	/each	4	$ 156,000.00	$ -	0	0
Labour	$ 500.00	/day/engineer	800	$ 400,000.00	$ -	0	0
Training Fees	$ 1,500.00	/ engineer	30	$ 45,000.00	$ -	0	0
Packaging/Shipping	$ 6,000.00	/container	10	$ 60,000.00	$ -	0	0
Extras	$ 15,000.00	/container	10	$ 150,000.00	$ -	0	0
System Installation (contracted)	$ 100,000.00			$ 100,000.00	$ -	$ -	$ -
Produce Bagging Station	$ 728.00		3 stations	$ 2,184.00	$ -	$ -	$ -
bag dispenser	$ 128.00	/ stand					
rolling carts	$ 600.00	/table					
Packaging station	$ 1,750.00		10 stations	$ 17,500.00	$ -	$ -	$ -
workbench	$ 750.00	/each					
tablet	$ 800.00	/each					
wall mount for tablet	$ 200.00	/each					
Admin offices	$ 2,200.00		4 stations	$ 8,800.00	$ -	$ -	$ -
Computer stations	$ 1,200.00	/station					
Desk	$ 350.00						
Chair	$ 200.00						
Printer	$ 250.00						
Whiteboard	$ 200.00						
Server	$ 10,000.00	/each		$ 10,000.00	$ -	$ -	$ -
Equipment Costs Subtotal ($)				**$ 2,670,084.00**	**$ -**	**$ -**	**$ -**
GST				*$ 133,504.20*	*$ -*	*$ -*	*$ -*
PST				*$ 213,606.72*	*$ -*	*$ -*	*$ -*
Equipment Costs ($)				$ 3,017,194.92	$ -	$ -	$ -

OPERATING COSTS

Consumables

Category	Value	Units	Qty	Installment 1	Installment 2	Installment 3	Installment 4
Seeding							
Total plants				0	983,040	1,597,440	737,280
Seed cost	$ 0.0035	/ seed (avg)		$ -	$ 3,440.64	$ 5,591.04	$ 2,580.48
Grow medium sponges	$ 0.01	/ sponge		$ -	$ 9,830.40	$ 15,974.40	$ 7,372.80
Polystyrene rafts	$ 5.00	/raft	1 year/raft set	$ -	$ -	$ 10,240.00	$ -
Cleaning							
Vinegar	$ 2.98	/gallon	0.5 gallons/units/month	$ -	$ 643.68	$ 1,501.92	$ 429.12
Baking Soda	$ 1.98	/package	0.5 packages/unit/month	$ -	$ 427.68	$ 997.92	$ 285.12
Bleach	$ 2.99	/gallon	2 gallons/unit/year	$ -	$ 215.28	$ 502.32	$ 143.52
Others (sponges, bottle cleaners, etc)	$ 45.00	/package	0.5 packages/unit/year	$ -	$ 810.00	$ 1,890.00	$ 540.00
Fertilizer							
Nutrient Mixture A	$ 10.00	/pound	25 pounds/unit/year	$ -	$ 4,000.00	$ 18,000.00	$ 6,000.00
Nutrient Mixture B	$ 10.00	/pound	25 pounds/unit/year	$ -	$ 4,000.00	$ 18,000.00	$ 6,000.00
Additions Nitric Acid (60%) 4L	$ 55.00	/gallon	1 gallons/unit/year	$ -	$ 880.00	$ 3,960.00	$ 1,320.00
Phosporic Acid 4L	$ 40.00	/gallon	0.5 gallons/unit/year	$ -	$ 320.00	$ 1,440.00	$ 480.00
Sanitizer (Boot Tray Apon Entry to Room)	$ 44.95	/gallon	0.5 gallons/month	$ -	$ 202.28	$ 471.98	$ 134.85
Hygene							
Hairnets (100/per package)	$ 10.95	/package	0.3 packages/employee/m	$ -	$ 364.64	$ 1,448.69	$ 473.04
Lab Coats (1/ package)	$ 83.00	/package	1 packages/employee/ye	$ -	$ 9,213.00	$ 29,797.00	$ 7,968.00
Gloves (100 pair / package)	$ 29.99	/package	3 packages/employee/ye	$ -	$ 832.22	$ 3,306.40	$ 1,079.64
Visitor lab coats (10 pack)	$ 66.95	/package	1 packages/month	$ -	$ 602.55	$ 1,405.95	$ 401.70
Other Supplies							
Mops	$ 34.98	/each	3 items/year	$ -	$ 104.94	$ 209.88	$ 104.94
Buckets	$ 5.47	/each	1 items/unit/year	$ -	$ 87.52	$ 437.60	$ 262.56
Extentable Swiffers (w/ 5 cloths)	$ 39.99	/each	25 items/year	$ -	$ 999.75	$ 1,999.50	$ 999.75
Squeegee	$ 34.98	/each	0.25 items/unit/year	$ -	$ 139.92	$ 699.60	$ 419.76
Cleaning rags (15 lbs / box)	$ 49.99	/ box	1 boxes/unit/year	$ -	$ 799.84	$ 3,999.20	$ 2,399.52
Papertowel (12 rolls / package)	$ 23.99	/package	4 packages/unit/year	$ -	$ 1,535.36	$ 7,676.80	$ 4,606.08
Garbage Bags (32 / box)	$ 19.45	/box	1 boxes/unit/year	$ -	$ 311.20	$ 1,556.00	$ 933.60
Packaging							
Paper bags (500/bundle)	$ 67.00	/bundle	2 bundles/unit/month	$ -	$ 19,296.00	$ 115,776.00	$ 38,592.00
Printer Labels (2 1/8 x 4)	$ 18.00	/roll (220)	5 labels/unit/month	$ -	$ 12,960.00	$ 77,760.00	$ 25,920.00
Plastic bags	$ 63.00	/roll (750)	2 bags/unit/month	$ -	$ 18,144.00	$ 108,864.00	$ 36,288.00
consumables Subtotal ($)				$ -	*$ 90,160.89*	*$ 433,506.19*	*$ 145,734.48*
GST				$ -	*$ 907.20*	*$ 5,443.20*	*$ 1,814.40*
PST				$ -	*$ 1,451.52*	*$ 8,709.12*	*$ 2,903.04*
Consumables Costs ($)				$ -	$ 92,519.61	$ 447,658.51	$ 150,451.92

Miscellaneous

Category	Value	Units	Qty	Installment 1	Installment 2	Installment 3	Installment 4
Operating / Administrative Costs							
Internet and phones	$ 250.00	/month		$ 1,750.00	$ 2,250.00	$ 5,250.00	$ 1,500.00
Legal fees	$ 7,500.00	/year		$ 15,000.00	$ 7,500.00	$ 15,000.00	$ -
Annual accountant fees	$ 5,000.00	/year		$ 5,000.00	$ 5,000.00	$ 10,000.00	$ -
Software (ex quickbooks)	$ 300.00	/year		$ 600.00	$ 300.00	$ 600.00	$ -
Community engagement	$ 500.00	/month		$ 12,000.00	$ 4,500.00	$ 10,500.00	$ 3,000.00
Employee perks (ex coffee)	$ 150.00	/month		$ 3,600.00	$ 1,350.00	$ 3,150.00	$ 900.00
Miscellaneous Costs ($)				$ 37,950.00	$ 20,900.00	$ 44,500.00	$ 5,400.00

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Labour

Category	Value	Units	Qty	Installment 1	Installment 2	Installment 3	Installment 4
Number of employees							
Manager (book keeping, promotions, order supplies)				0	1	1	1
Supervisor (planting supervisor and packaging supervisor)				0	1	1	1
Planter/harvestor			3 units / harvestor	0	6	11	16
Packager			3 harvesters / packager	0	2	4	6
Custodian							
Total Employees				0	10	17	24
Cost of employees							
Manager Salary	$ 60,000.00	/year		$ -	$ 45,000.00	$ 105,000.00	$ 30,000.00
Supervisor Salary	$ 45,000.00	/year		$ -	$ 33,750.00	$ 78,750.00	$ 22,500.00
Planter/harvestor Salary	$ 34,000.00	/year		$ -	$ 195,500.00	$ 824,500.00	$ 272,000.00
Packager Salary	$ 34,000.00	/year		$ -	$ 68,000.00	$ 306,000.00	$ 102,000.00
Custodian Salary	$ 30,000.00	/year		$ 7,500.00	$ 22,500.00	$ 7,500.00	$ -
Labour Costs ($)				$ -	$ 342,250.00	$ 1,314,250.00	$ 426,500.00
Total Costs ($)				**$ 4,567,191.60**	**$ 614,262.06**	**$ 2,239,965.19**	**$ 717,443.75**

INCOME

	Installment 1	Installment 2	Installment 3	Installment 4
Active Beds	0	21	41	48
Product Spoilage Rates		50%	30%	15%

Local production

Product	lbs (or bunches)/plant/l	Cycle Time		Density and Price	Installment 1	Installment 2	Installment 3	Installment 4
Strawberries	2.5	12	weeks/harvest	4 plants/sq.ft. $ 3.99 /lb	0 $ -	1.7 $ 58,055.50	3.6 $ 387,873.49	4 $ 130,546.42
Lettuce	1	4	weeks/harvest	8 plants/sq.ft. $ 1.98 /head	0 $ -	1.3 $ 54,566.74	2.6 $ 333,380.36	3 $ 116,608.38
Spinach	0.25	4	weeks/harvest	8 plants/sq.ft. $ 7.11 /lb	0 $ -	1.3 $ 48,986.05	2.6 $ 299,284.64	3 $ 104,682.52
Bok Choi		6	weeks/harvest	4 plants/sq.ft. $ 2.26 /head	0 $ -	1.3 $ 20,761.08	2 $ 97,833.05	2 $ 29,577.43
Honeydew Melo		8	weeks/harvest	0.5 plants/sq.ft. $ 4.79 /per	0 $ -	0 $ -	1.1 $ 11,528.05	2 $ 5,877.04
Cantaloupe		8	weeks/harvest	0.5 plants/sq.ft. $ 2.99 /per	0 $ -	0 $ -	1.1 $ 7,196.00	2 $ 3,668.55
Tomatoes	5	8	weeks/harvest	1 plants/sq.ft. $ 2.98 /lb	0 $ -	1.3 $ 25,664.28	2 $ 120,938.53	2 $ 36,562.81
Cabbage		8	weeks/harvest	1 plants/sq.ft. $ 3.60 /per	0 $ -	1.3 $ 6,200.77	2 $ 29,220.05	2 $ 8,833.97
Broccoli		8	weeks/harvest	1 plants/sq.ft. $ 3.50 /per	0 $ -	1.3 $ 9,909.90	2 $ 34,684.65	2 $ 9,909.90
Cauliflower		12	weeks/harvest	1 plants/sq.ft. $ 3.50 /per	0 $ -	1.3 $ 4,019.02	2 $ 18,938.92	2 $ 5,725.72
Onion		12	weeks/harvest	8 plants/sq.ft. $ 1.15 /per	0 $ -	1.3 $ 10,564.27	2 $ 49,782.30	2 $ 15,050.46
Kohlrabi		6.4	weeks/harvest	4 plants/sq.ft. $ 3.97 /per	0 $ -	0 $ -	1.1 $ 95,545.59	2 $ 48,709.52
Chard		4	weeks/harvest	4 plants/sq.ft. $ 2.97 head	0 $ -	0 $ -	1.1 $ 114,365.91	2 $ 58,304.19
Beets		6	weeks/harvest	8 plants/sq.ft. $ 0.62 /per	0 $ -	1.3 $ 11,391.04	2 $ 53,678.31	2 $ 16,228.33
Radishes		4	weeks/harvest	16 plants/sq.ft. $ 0.30 /per	0 $ -	0 $ -	1.1 $ 46,208.45	2 $ 23,557.25
Kale		6	weeks/harvest	1 plants/sq.ft. $ 2.98 head	0 $ -	1.3 $ 6,843.81	2 $ 32,250.28	2 $ 9,750.08
Carrots		10	weeks/harvest	16 plants/sq.ft. $ 0.50 /per	0 $ -	1.3 $ 11,023.58	2 $ 51,946.75	2 $ 15,704.83
Celery		12	weeks/harvest	4 plants/sq.ft. $ 1.97 /per	0 $ -	0 $ -	1.1 $ 25,286.29	2 $ 12,891.05
Okra	1	8	weeks/harvest	1 plants/sq.ft. $ 4.99 /lb	0 $ -	0.7 $ 4,591.82	2 $ 40,502.23	2 $ 12,244.86
Basil	1	9	weeks/harvest	2 plants/sq.ft. ##### /lb	0 $ -	1.3 $ 34,173.11	2.6 $ 208,783.66	3 $ 73,027.47
Cilantro	2	4	weeks/harvest	1 plants/sq.ft. $ 2.00 /bunch	0 $ -	1 $ 10,098.66	1 $ 32,466.72	1 $ 9,815.52
Dill	2	4	weeks/harvest	1 plants/sq.ft. $ 2.00 /bunch	0 $ -	1 $ 10,098.66	1 $ 32,466.72	1 $ 9,815.52
Mint	2	4	weeks/harvest	1 plants/sq.ft. $ 2.00 /bunch	0 $ -	1 $ 10,098.66	1 $ 32,466.72	1 $ 9,815.52
Ice plant	?				0 $ -	0 $ -	0 $ -	0 $ -
Production Income ($)					$ -	$ -	$ 2,156,627.67	$ 766,907.34
Total Income ($)					**$ -**	**$ -**	**$ 2,156,627.67**	**$ 766,907.34**
Buffer		*15%*			*$ 685,078.74*	*$ 92,139.31*	*$ 335,994.78*	*$ 107,616.56*
TOTAL BUDGET - Smart Farm ($)					***$ 5,252,270.34***	***$ 706,401.37***	***$ 419,332.30***	***$ 58,152.97***

Figure 17 Smart Farm detailed budget

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8.2.3.1 General Budget

8.2.3.1.1 Energy Use Budget

Electricity is primarily used for operation of the Smart Farm and serves many functions, most notably it is the feedstock for light energy needed for food growth. The Smart Farm will use more than 3000 light units to drive photosynthesis. The conversion of electricity to light is accompanied by heat generation and so air conditioning system will be used to remove that heat from the grow area. The Smart Farm technology from KAST utilizes high efficiency LED lighting system to minimize heat production; however, some degree of heat production is unavoidable. Circulation of nutrients with pumps and mixers is another source of energy usage. General lighting, control system operation, air circulation, and dehumidification are also users of electricity in the Smart Farm. During the construction phase this will also include power tool operation, and other miscellaneous contractor equipment.

Figure 18 illustrates the relative contribution of each of these categories to the overall energy bill, based on KAST's recommended energy use numbers, and the projected cost of energy at each installment based on Manitoba Hydro commercial account rates and projected rate increases over the coming five years.

Energy Use

Category	Value	Units	Qty	Installment 1	Installment 2	Installment 3	Installment 4
Lights Energy Use (kw*h)				0	239,206	1,076,429	358,810
Air Conditioner (kw*h)				0	84,096	378,432	126,144
Nutrients (kw*h)				0	23,635	106,356	35,452
Misc (kw*h)				1,425,705	534,639	1,247,492	356,426
Total Energy Use (kw*h)				1,425,705	881,576	2,808,709	876,832
Electricity Cost							
Basic Electricity Cost ($)				$ 356.40	$ 388.48	$ 420.55	$ 452.63
First 11,000 kwh/month ($/kw*h)				$ 0.09	$ 0.10	$ 0.10	$ 0.11
Next 8,500 kwh/month ($/kw*h)				$ 0.06	$ 0.07	$ 0.07	$ 0.08
Additional kwh/month ($/kw*h)				$ 0.04	$ 0.04	$ 0.05	$ 0.05
Electricity Costs ($)				$ 79,873.05	$ 50,639.41	$ 172,579.21	$ 59,110.51

Figure 18 Smart Farm - energy use budget

8.2.3.1.2 Water Use Budget

Water is used extensively in the Smart Farm as it is the nutrient delivery medium, and a critical input in the cultivation of food products. Water usage is estimated based on KAST's recommended values of monthly consumption per month as well as the volume required to refill beds following a quarterly cleaning cycle. The cost of water is then calculated based on a quarterly service charge and cost per 1000 gallons delivered as per municipality rates. *Figure 19* below identifies these costs and rates in a tabular format.

Water Use

Category	Value	Units	Qty	Installment 1	Installment 2	Installment 3	Installment 4
Total water in beds (gallons)		250 L/bed		0	50,526	227,368	75,789
Water Use per harvest (gallons/harvest)		500% consumed / harvest		0	252,632	1,136,842	378,947
Water Use per month (gallons/month)		10 harvests/year (average)		0	210,526	947,368	315,789
Water Cost							
Service Charge (quarterly rate)				$ 34.27	$ 42.47	$ 52.63	$ 65.23
Service Charge (annual)				$ 137.08	$ 169.88	$ 210.53	$ 260.90
First 20,000 gallons ($/1,000 gallons)				$ 11.71	$ 11.75	$ 11.78	$ 11.82
Over 20,000 gallons ($/1,000 gallons)				$ 9.93	$ 11.74	$ 13.87	$ 16.40
Water Cost ($)				$ 306.96	$ 2,953.04	$ 15,977.48	$ 5,981.32

Figure 19 Smart Farm - water use budget

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8.2.3.1.3 Rent Budget

Rent in the Otineka mall is payable monthly and has been quoted by administration. The current tenant of the space is departing in May of 2019, and so the 19,500 square foot space will be available for the implementation of this project. Rent rates have been quoted by mall administration. *Figure 20* illustrates this monthly expense by installment.

Rent								
Item	Value	Units	Qty	Installment 1	Installment 2	Installment 3	Installment 4
Rental of space in Otineka mall	$ 140,000.00	/year		$ 256,666.67	$ 105,000.00	$ 245,000.00	$ 70,000.00
Rent Cost ($)				$ 256,666.67	$ 105,000.00	$ 245,000.00	$ 70,000.00

Figure 20 Smart Farm - rent budget

8.2.3.2 Building Budget

8.2.3.2.1 Preparation Budget

In preparation for the Smart Farm system, the space in the Otineka mall will need to be renovated to provide partition walls and the electrical infrastructure for operation of the Smart Farm. A preliminary rendering of the space is attached at the end of this chapter for reference. An estimated $50/square foot has been used for calculation of construction costs given the minimal remodelling needed for the space; construction of a few walls, installation of basic electrical infrastructure within those walls, as well as some plumbing infrastructure.

Figure 21 identifies items within this budget, including completion of construction drawings, which will be done upon progression to the implementation phase, general construction materials and contract labour, as well as fixtures and appliances such as vacuums, lockers and shelving for employees, as well as coolers and tables for processing of plant factory products.

Preparation							
Category	Value	Units	Qty	Installment 1	Installment 2	Installment 3	Installment 4
Renovations							
Construction Drawings	$ 30,000.00			$ 30,000.00	$ -	$ -	$ -
Procurment (building supplies)	$ 400,000.00			$ 400,000.00	$ -	$ -	$ -
Construction	$ 400,000.00			$ 400,000.00	$ -	$ -	$ -
Central Vacuum	$ 10,000.00			$ 10,000.00	$ -	$ -	$ -
Lockers, shelving, boot racks for staff	$ 10,000.00			$ 10,000.00	$ -	$ -	$ -
Fixture (counters, sinks, coolers, tables)	$ 105,000.00			$ 105,000.00	$ -	$ -	$ -
Completion	$ 50,000.00			$ 50,000.00	$ -	$ -	$ -
Security Camera system	$ 35,000.00	/system		$ 35,000.00	$ -	0	0
Preparation Costs Subtotal ($)				$ 1,040,000.00	$ -	$ -	$ -
GST				*$ 52,000.00*	$ -	$ -	$ -
PST				*$ 83,200.00*	$ -	$ -	$ -
Preparation Costs ($)				$ 1,175,200.00	$ -	$ -	$ -

Figure 21 Smart Farm building - preparation budget

8.2.3.2.2 Equipment Budget

The equipment required for this project is identified in *Figure 22*. The largest item in this budget is the Smart Farm hardware, for which a quote has been provided by KAST, along with preliminary floorplan drawings outlining the intended equipment layout. Equipment will be received in shipping containers and system assembly and installation will take place following its receipt by technicians of the pilot OCN Smart Farm

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project. Contracted support staff will be used to assist the technicians in assembling this equipment. Cost estimates have been made for assembly and installation costs based on the known assembly time of the pilot Smart Farm and the increased scale of this Smart Farm.

Prices for bagging stations, packaging stations, administrative office equipment, and server equipment is based on supplier list pricing for components.

Equipment

Category	Value	Units	Qty	Installment 1	Installment 2	Installment 3	Installment 4
Smart Farm System Cost (terms 50% down, 40% on arrival, 10% aft. training)						$ -	
Electrical system	$ 33,000.00	/each	1	$ 33,000.00	$ -	0	0
Physical Structure	$ 6,500.00	/each	48	$ 312,000.00	$ -	0	0
Environmental System	$ 4,000.00	/each	4	$ 16,000.00	$ -	0	0
Lighting System	$ 300.00	/each	3072	$ 921,600.00	$ -	0	0
Nutrient System	$ 100,000.00	/each	4	$ 400,000.00	$ -	0	0
Control System	$ 9,500.00	/each	4	$ 38,000.00	$ -	0	0
HVAC System	$ 39,000.00	/each	4	$ 156,000.00	$ -	0	0
Labour	$ 500.00	/day/engineer	800	$ 400,000.00	$ -	0	0
Training Fees	$ 1,500.00	/ engineer	30	$ 45,000.00	$ -	0	0
Packaging/Shipping	$ 6,000.00	/container	10	$ 60,000.00	$ -	0	0
Extras	$ 15,000.00	/container	10	$ 150,000.00	$ -	0	0
System Installation (contracted)	$ 100,000.00			$ 100,000.00	$ -	$ -	$ -
Produce Bagging Station	$ 728.00		3 stations	$ 2,184.00	$ -	$ -	$ -
bag dispenser	$ 128.00	/ stand					
rolling carts	$ 600.00	/table					
Packaging station	$ 1,750.00		10 stations	$ 17,500.00	$ -	$ -	$ -
workbench	$ 750.00	/each					
tablet	$ 800.00	/each					
wall mount for tablet	$ 200.00	/each					
Admin offices	$ 2,200.00		4 stations	$ 8,800.00	$ -	$ -	$ -
Computer stations	$ 1,200.00	/station					
Desk	$ 350.00						
Chair	$ 200.00						
Printer	$ 250.00						
Whiteboard	$ 200.00						
Server	$ 10,000.00	/each		$ 10,000.00	$ -	$ -	$ -
Equipment Costs Subtotal ($)				**$ 2,670,084.00**	$ -	$ -	$ -
GST				*$ 133,504.20*	$ -	$ -	$ -
PST				*$ 213,606.72*	$ -	$ -	$ -
Equipment Costs ($)				$ 3,017,194.92	$ -	$ -	$ -

Figure 22 Smart Farm building - equipment budget

8.2.3.3 Operating Budget

8.2.3.3.1 Consumables Budget

Operation of the Smart Farm includes the use of many consumables, identified in *Figure 23*. The items identified on the list below are derived from the operations budget of the pilot Smart Farm that has been running in OCN since 2015. By scaling the quantity of items used for the pilot Smart Farm, based on relative number of growing beds available, costs for seeding, cleaning, and nutrients have been assigned. The price of hygiene supplies, including lab coats, gloves, and hairnets are catalog prices from the supplier and quantities needed have been estimated based on the number of employees anticipated to be working at the Smart Farm through each installment stage. The pilot Smart Farm has experienced a significant number of visitors throughout the past 4 years, and so, visitor hygiene supplies have been estimated based on these known values.

The price of cleaning supplies and packaging supplies is established based on catalog price from suppliers. Quantities of cleaning supplies are estimated based on the known quantity needed for the pilot Smart Farm

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and the proportional size of the Smart Farm facility in question. Quantities of packaging supplies are estimated based on projected production rates.

Consumables								
Category	Value	Units	Qty	Installment 1	Installment 2	Installment 3	Installment 4
Seeding							
Total plants				0	983,040	1,597,440	737,280
Seed cost	$ 0.0035	/ seed (avg)		$ -	$ 3,440.64	$ 5,591.04	$ 2,580.48
Grow medium sponges	$ 0.01	/ sponge		$ -	$ 9,830.40	$ 15,974.40	$ 7,372.80
Polystyrene rafts	$ 5.00	/raft	1 year/raft set	$ -	$ -	$ 10,240.00	$ -
Cleaning							
Vinegar	$ 2.98	/gallon	0.5 gallons/units/month	$ -	$ 643.68	$ 1,501.92	$ 429.12
Baking Soda	$ 1.98	/package	0.5 packages/unit/month	$ -	$ 427.68	$ 997.92	$ 285.12
Bleach	$ 2.99	/gallon	2 gallons/unit/year	$ -	$ 215.28	$ 502.32	$ 143.52
Others (sponges, bottle cleaners, etc)	$ 45.00	/package	0.5 packages/unit/year	$ -	$ 810.00	$ 1,890.00	$ 540.00
Fertilizer							
Nutrient Mixture A	$ 10.00	/pound	25 pounds/unit/year	$ -	$ 4,000.00	$ 18,000.00	$ 6,000.00
Nutrient Mixture B	$ 10.00	/pound	25 pounds/unit/year	$ -	$ 4,000.00	$ 18,000.00	$ 6,000.00
Additions Nitric Acid (60%) 4L	$ 55.00	/gallon	1 gallons/unit/year	$ -	$ 880.00	$ 3,960.00	$ 1,320.00
Phosporic Acid 4L	$ 40.00	/gallon	0.5 gallons/unit/year	$ -	$ 320.00	$ 1,440.00	$ 480.00
Sanitizer (Boot Tray Apon Entry to Room)	$ 44.95	/gallon	0.5 gallons/month	$ -	$ 202.28	$ 471.98	$ 134.85
Hygene							
Hairnets (100/per package)	$ 10.95	/package	0.3 packages/employee/m	$ -	$ 364.64	$ 1,448.69	$ 473.04
Lab Coats (1/ package)	$ 83.00	/package	1 packages/employee/ye	$ -	$ 9,213.00	$ 29,797.00	$ 7,968.00
Gloves (100 pair / package)	$ 29.99	/package	3 packages/employee/ye	$ -	$ 832.22	$ 3,306.40	$ 1,079.64
Visitor lab coats (10 pack)	$ 66.95	/package	1 packages/month	$ -	$ 602.55	$ 1,405.95	$ 401.70
Other Supplies							
Mops	$ 34.98	/each	3 items/year	$ -	$ 104.94	$ 209.88	$ 104.94
Buckets	$ 5.47	/each	1 items/unit/year	$ -	$ 87.52	$ 437.60	$ 262.56
Extentable Swiffers (w/ 5 cloths)	$ 39.99	/each	25 items/year	$ -	$ 999.75	$ 1,999.50	$ 999.75
Squeegee	$ 34.98	/each	0.25 items/unit/year	$ -	$ 139.92	$ 699.60	$ 419.76
Cleaning rags (15 lbs / box)	$ 49.99	/ box	1 boxes/unit/year	$ -	$ 799.84	$ 3,999.20	$ 2,399.52
Papertowel (12 rolls / package)	$ 23.99	/package	4 packages/unit/year	$ -	$ 1,535.36	$ 7,676.80	$ 4,606.08
Garbage Bags (32 / box)	$ 19.45	/box	1 boxes/unit/year	$ -	$ 311.20	$ 1,556.00	$ 933.60
Packaging							
Paper bags (500/bundle)	$ 67.00	/bundle	2 bundles/unit/month	$ -	$ 19,296.00	$ 115,776.00	$ 38,592.00
Printer Labels (2 1/8 x 4)	$ 18.00	/roll (220)	5 labels/unit/month	$ -	$ 12,960.00	$ 77,760.00	$ 25,920.00
Plastic bags	$ 63.00	/roll (750)	2 bags/unit/month	$ -	$ 18,144.00	$ 108,864.00	$ 36,288.00
Consumables Subtotal ($)				$ -	$ 90,160.89	$ 433,506.19	$ 145,734.48
GST				*$ -*	*$ 907.20*	*$ 5,443.20*	*$ 1,814.40*
PST				*$ -*	*$ 1,451.52*	*$ 8,709.12*	*$ 2,903.04*
Consumables Costs ($)				$ -	$ 92,519.61	$ 447,658.51	$ 150,451.92

Figure 23 Smart Farm operations – consumables budget

8.2.3.3.2 Miscellaneous Budget

A list of miscellaneous operating costs is included in *Figure 24* below.

There are several ongoing operating costs, including internet, phone, community engagement costs (ex. printing, survey software subscriptions, community cooking class consumables, travel costs associated with visiting the school or similar activities) that are anticipated to occur on a monthly basis. The price of the internet and phone are based on list prices from local service providers. Community engagement costs are estimated based on projected activities. This cost is calculated as a monthly cost in the budget, however it is not anticipated to be recurring with the same consistency as phone and internet expenses.

Legal fees have been assigned based on the estimated cost for completion of the formation of the not-for-profit corporation identified in Chapter 2, as well as the creation of associated by-law documents. Annual accounting fees are assigned for the completion of year end financial documents required for the not-for-profit corporation. These will need to be completed on an annual basis. Bookkeeping software, such as Quickbooks, will be required to keep track of income and expenses on a month to month basis. The subscription for this software has been established based on a list price from the supplier's website.

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Miscellaneous

Category	Value	Units	Qty	Installment 1	Installment 2	Installment 3	Installment 4
Operating / Administrative Costs							
Internet and phones	$ 250.00	/month		$ 1,750.00	$ 2,250.00	$ 5,250.00	$ 1,500.00
Legal fees	$ 7,500.00	/year		$ 15,000.00	$ 7,500.00	$ 15,000.00	$ -
Annual accountant fees	$ 5,000.00	/year		$ 5,000.00	$ 5,000.00	$ 10,000.00	$ -
Software (ex quickbooks)	$ 300.00	/year		$ 600.00	$ 300.00	$ 600.00	$ -
Community engagement	$ 500.00	/month		$ 12,000.00	$ 4,500.00	$ 10,500.00	$ 3,000.00
Employee perks (ex coffee)	$ 150.00	/month		$ 3,600.00	$ 1,350.00	$ 3,150.00	$ 900.00
Miscellaneous Costs ($)				$ 37,950.00	$ 20,900.00	$ 44,500.00	$ 5,400.00

Figure 24 Smart Farm operations - miscellaneous budget

8.2.3.3.3 Labour Budget

Operation of the Smart Farm will require the hiring of staff for the positions of Smart Farm manager, supervisor, planter/harvester, packager, and custodian. (Note, labour costs associated with operation of the smartphone distribution system are identified in a later section). All salary values are assigned based on values used for the pilot Plant Factory. The number of personnel assigned to the role of planter/harvester and packager are estimated by scaling the number of employees required to operate the pilot Smart Farm in OCN. It is assumed that a similar ratio of planters/harvesters and packagers to number of active beds is consistent between the pilot Smart Farm and this project's Smart Farm. Therefore, based on the number of active Smart Farm beds that will be operating throughout the ramp up process of this project, the number of required employees has been estimated. These values are all presented in *Figure 25* below.

The intended strategy for establishing the correct employee to active grow bed ratio will involve starting with a fewer number of employees and having them perform seeding, planting, and harvesting operations through several harvesting cycles. As they gain familiarity with their required tasks, the number of beds they are responsible for will be increased and further employees will be added as necessary.

Labour

Category	Value	Units	Qty	Installment 1	Installment 2	Installment 3	Installment 4
Number of employees							
Manager (book keeping, promotions, order supplies)				0	1	1	1
Supervisor (planting supervisor and packaging supervisor)				0	1	1	1
Planter/harvestor			3 units / harvestor	0	6	11	16
Packager			3 harvesters / packager	0	2	4	6
Custodian							
Total Employees				0	10	17	24
Cost of employees							
Manager Salary	$ 60,000.00	/year		$ -	$ 45,000.00	$ 105,000.00	$ 30,000.00
Supervisor Salary	$ 45,000.00	/year		$ -	$ 33,750.00	$ 78,750.00	$ 22,500.00
Planter/harvestor Salary	$ 34,000.00	/year		$ -	$ 195,500.00	$ 824,500.00	$ 272,000.00
Packager Salary	$ 34,000.00	/year		$ -	$ 68,000.00	$ 306,000.00	$ 102,000.00
Custodian Salary	$ 30,000.00	/year		$ 7,500.00	$ 22,500.00	$ 7,500.00	$ -
Labour Costs ($)				$ -	$ 342,250.00	$ 1,314,250.00	$ 426,500.00

Figure 25 Smart Farm operations - labour budget

8.2.3.4 Income Budget

Operation of the Smart Farm will commence following the release of installment 2. The food products created through operation of the Smart Farm will be sold to community members and so the income associated with projected sales is outlined below in *Figure 26*. The calculation is performed on a month to month basis and is based on the number of anticipated active beds, species specific planting density, spoilage rates, and the projected market bearable price per unit.

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Species specific planting density is well-established knowledge in the hydroponic community and the Smart Farm manufacturer furthermore provides recommendations for planting densities for their equipment.

Spoilage rate considerations include anticipated crop failure while employees are establishing familiarity with the equipment and unpurchased product. Furthermore, during the ramp up stage following receipt of installment 2, no income is calculated. This is done to create a financially safe learning period where operations are not dependent on revenue for sustainability.

Price per unit of each product has been determined based on a market survey of same-species products at superstore in Winnipeg; generally considered an inexpensive produce supplier in the region. Those prices will be further refined with time, giving consideration both to market bearable prices and to cover operating costs. The intention is to establish a pricing model and product mix that decreases the cost of high-quality food within the community.

Active Beds					0	21	41	48
Product Spoilage Rates						50%	30%	15%
Local production								
Product	lbs (or bunches)/plant/l	Cycle Time		Density and Price	Installment 1	Installment 2	Installment 3	Installment 4
Strawberries	2.5	12	weeks/harvest	4 plants/sq.ft. $ 3.99 /lb	0 $ -	1.7 $ 58,055.50	3.6 $ 387,873.49	4 $ 130,546.42
Lettuce	1	4	weeks/harvest	8 plants/sq.ft. $ 1.98 /head	0 $ -	1.3 $ 54,566.74	2.6 $ 333,380.36	3 $ 116,608.38
Spinach	0.25	4	weeks/harvest	8 plants/sq.ft. $ 7.11 /lb	0 $ -	1.3 $ 48,986.05	2.6 $ 299,284.64	3 $ 104,682.52
Bok Choi		6	weeks/harvest	4 plants/sq.ft. $ 2.26 /head	0 $ -	1.3 $ 20,761.08	2 $ 97,833.05	2 $ 29,577.43
Honeydew Melo		8	weeks/harvest	0.5 plants/sq.ft. $ 4.79 /per	0 $ -	0 $ -	1.1 $ 11,528.05	2 $ 5,877.04
Cantaloupe		8	weeks/harvest	0.5 plants/sq.ft. $ 2.99 /per	0 $ -	0 $ -	1.1 $ 7,196.00	2 $ 3,668.55
Tomatoes	5	8	weeks/harvest	1 plants/sq.ft. $ 2.98 /lb	0 $ -	1.3 $ 25,664.28	2 $ 120,938.53	2 $ 36,562.81
Cabbage		8	weeks/harvest	1 plants/sq.ft. $ 3.60 /per	0 $ -	1.3 $ 6,200.77	2 $ 29,220.05	2 $ 8,833.97
Broccoli		8	weeks/harvest	1 plants/sq.ft. $ 3.50 /per	0 $ -	1.3 $ 9,909.90	2 $ 34,684.65	2 $ 9,909.90
Cauliflower		12	weeks/harvest	1 plants/sq.ft. $ 3.50 /per	0 $ -	1.3 $ 4,019.02	2 $ 18,938.92	2 $ 5,725.72
Onion		12	weeks/harvest	8 plants/sq.ft. $ 1.15 /per	0 $ -	1.3 $ 10,564.27	2 $ 49,782.30	2 $ 15,050.46
Kohlrabi		6.4	weeks/harvest	4 plants/sq.ft. $ 3.97 /per	0 $ -	0 $ -	1.1 $ 95,545.59	2 $ 48,709.52
Chard		4	weeks/harvest	4 plants/sq.ft. $ 2.97 head	0 $ -	0 $ -	1.1 $ 114,365.91	2 $ 58,304.19
Beets		6	weeks/harvest	8 plants/sq.ft. $ 0.62 /per	0 $ -	1.3 $ 11,391.04	2 $ 53,678.31	2 $ 16,228.33
Radishes		4	weeks/harvest	16 plants/sq.ft. $ 0.30 /per	0 $ -	0 $ -	1.1 $ 46,208.45	2 $ 23,557.25
Kale		6	weeks/harvest	1 plants/sq.ft. $ 2.98 head	0 $ -	1.3 $ 6,843.81	2 $ 32,250.28	2 $ 9,750.08
Carrots		10	weeks/harvest	16 plants/sq.ft. $ 0.50 /per	0 $ -	1.3 $ 11,023.58	2 $ 51,946.75	2 $ 15,704.83
Celery		12	weeks/harvest	4 plants/sq.ft. $ 1.97 /per	0 $ -	0 $ -	1.1 $ 25,286.29	2 $ 12,891.05
Okra	1	8	weeks/harvest	1 plants/sq.ft. $ 4.99 /lb	0 $ -	0.7 $ 4,591.82	2 $ 40,502.23	2 $ 12,244.86
Basil	1	9	weeks/harvest	2 plants/sq.ft. $ 11.16 /lb	0 $ -	1.3 $ 34,173.11	2.6 $ 208,783.66	3 $ 73,027.47
Cilantro	2	4	weeks/harvest	1 plants/sq.ft. $ 2.00 /bunch	0 $ -	1 $ 10,098.66	1 $ 32,466.72	1 $ 9,815.52
Dill	2	4	weeks/harvest	1 plants/sq.ft. $ 2.00 /bunch	0 $ -	1 $ 10,098.66	1 $ 32,466.72	1 $ 9,815.52
Mint	2	4	weeks/harvest	1 plants/sq.ft. $ 2.00 /bunch	0 $ -	1 $ 10,098.66	1 $ 32,466.72	1 $ 9,815.52
Ice plant	?				0 $ -	0 $ -	0 $ -	0 $ -
Production Income ($)					$ -	$ -	$ 2,156,627.67	$ 766,907.34

Figure 26 Smart Farm operations - income budget

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8.2.4 Smartphone Distribution System Budget

The following budget, *Figure 27*, is a complete budget for the smartphone distribution system, presented in two activity categories, building and operating, and further broken down to a list of equipment expenses and labour expenses (hard expenses and soft expenses). Detailed descriptions follow.

Smartphone Distribution System Costs *Budget Summary*				*Installment 1* $ 632,306.77	*Installment 2* $ 105,593.46	*Installment 3* $ 478,179.80	*Installment 4* $ 96,711.83
Building Costs							
Equipment							
Product	**Value**	**Units**	**Qty**	**Installment 1**	**Installment 2**	**Installment 3**	**Installment 4**
Vehicles	$ 48,500.00			2	0	2	0
Chevy bolt	$ 47,000.00			$ 94,000.00	$ -	$ 94,000.00	$ -
Vehicle tablet and mounting	$ 1,000.00			$ 2,000.00	$ -	$ 2,000.00	$ -
Installation	$ 500.00			$ 1,000.00	$ -	$ 1,000.00	$ -
DC rapid charging station				2	0	0	0
Flo DC Rapid Charger	$ 40,000.00	/each		$ 80,000.00	$ -	$ -	$ -
Charging station installation	$ 5,000.00	/each		$ 10,000.00	$ -	$ -	$ -
75kva 600v transformer	$ 5,000.00	/each		$ 10,000.00	$ -	$ -	$ -
6/3 Teck Cable	$ 15.18	/m	250 m/system	$ 30.36	$ -	$ -	$ -
Level 2 Charging station				2	0	0	0
Flo Level 2	$ 12,100.00	/each		$ 24,200.00	$ -	$ -	$ -
Charging station installation	$ 5,000.00	/each		$ 10,000.00	$ -	$ -	$ -
6/3 Teck Cable	$ 15.18	/m	250 m/system	$ 7,590.00	$ -	$ -	$ -
Equipment Subtotal ($)				$ 238,820.36	$ -	$ 97,000.00	$ -
GST				$ 11,941.02	$ -	$ 4,850.00	$ -
PST				$ 16,717.43	$ -	$ 6,790.00	$ -
Equipment Costs ($)				$ 267,478.80	$ -	$ 108,640.00	$ -
Software Development Costs							
Category	**Value**	**Units**	**Qty**	**Installment 1**	**Installment 2**	**Installment 3**	**Installment 4**
Software Development							
Online marketplace, packaging and distributi	$ 250,000.00			$ 250,000.00	$ -	$ -	$ -
Maintenance							
Annual software updates	$ 25,000.00			$ -	$ 25,000.00	$ 50,000.00	$ -
Software Development Subtotal ($)				$ 250,000.00	$ 25,000.00	$ 50,000.00	$ -
GST				$ 12,500.00	$ 1,250.00	$ 2,500.00	$ -
PST				$ 20,000.00	$ 2,000.00	$ 4,000.00	$ -
Software Development Total ($)				$ 282,500.00	$ 28,250.00	$ 56,500.00	$ -
Operating Costs							
Vehicles							
Product	**Value**	**Units**	**Qty**	**Installment 1**	**Installment 2**	**Installment 3**	**Installment 4**
Total vehicles				0	2	4	4
Electricity (200km/day, 250days/year)	0.16	kw*h/km	50,000 km/vehicle/year	$ -	$ 581.69	$ 2,544.77	$ 959.63
Maintenance (brakes, tire rotation, wiper blade	$ 500.00	/vehicle/year		$ -	$ 750.00	$ 3,000.00	$ 1,000.00
Tires (100,000km replacement interval)	$ 1,000.00	/vehicle		$ -	$ -	$ 2,000.00	$ -
Consumables (wiper fluid, car washes, etc)	$ 500.00	/vehicle/year		$ -	$ 750.00	$ 2,916.67	$ 1,000.00
Cell phone plan for tablet	$ 80.00	/vehicle/month		$ -	$ 1,440.00	$ 5,600.00	$ 1,920.00
Vehicles Subtotal ($)				$ -	$ 3,521.69	$ 16,061.44	$ 4,879.63
GST				$ -	$ 176.08	$ 803.07	$ 243.98
PST				$	$ 281.74	$ 1,284.91	$ 390.37
Vehicles Costs ($)				$ -	$ 3,979.51	$ 18,149.42	$ 5,513.98
Labour							
Category	**Value**	**Units**		**Installment 1**	**Installment 2**	**Installment 3**	**Installment 4**
Drivers				0	2	4	4
Driver salary	$ 40,000.00	/driver/year		$ -	$ 60,000.00	$ 233,333.33	$ 80,000.00
Labour Costs ($)				$ -	$ 60,000.00	$ 233,333.33	$ 80,000.00
Total Costs ($)				$ 549,978.80	$ 92,229.51	$ 416,622.76	$ 85,513.98
Income							
Charging Stations							
Category	**Value**	**Units**		**Installment 1**	**Installment 2**	**Installment 3**	**Installment 4**
Customers/year				25	67	336	150
Energy / year (kwh/year)	50	kwh/customer (avg)		1,250	3,350	16,800	7,500
Energy price ($/kwh)				$ 0.04	$ 0.04	$ 0.05	$ 0.05
Energy Cost				$ 51.35	$ 150.50	$ 328.39	$ 657.24
Charge price ($/h)				$ 10.00	$ 11.00	$ 11.00	$ 11.00
Gross Income				$ 250.00	$ 704.00	$ 1,430.00	$ 2,574.00
Charging Station Income ($)				$ 198.65	$ 553.50	$ 1,101.61	$ 1,916.76
Total Income($)				$ 198.65	$ 553.50	$ 1,101.61	$ 1,916.76
Buffer		15%		$ 82,526.62	$ 13,917.45	$ 62,658.65	$ 13,114.61
TOTAL BUDGET - Smartphone Distribution System($)				$ 632,306.77	$ 105,593.46	$ 478,179.80	$ 96,711.83

Figure 27 smartphone distribution detailed budget

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8.2.4.1 Building Budget

8.2.4.1.1 Equipment Budget

The smartphone distribution system requires acquisition of electric vehicles and their supporting charging infrastructure. Quotes have been secured for all components as well as estimates on installation of the charging infrastructure. Acquisition of vehicles and installation of their chargers will take place during the building stage of project implementation with monies from Installment 1. The need for two additional vehicles is anticipated at some point in year four with financing from installment 3. The costs associated with these items is outlined in *Figure 28*.

Equipment								
Product	**Value**	**Units**	**Qty**	**Installment 1**	**Installment 2**	**Installment 3**	**Installment 4**
Vehicles	$ 48,500.00			2	0	2	0
Chevy bolt	$ 47,000.00			$ 94,000.00	$ -	$ 94,000.00	$ -
Vehicle tablet and mounting	$ 1,000.00			$ 2,000.00	$ -	$ 2,000.00	$ -
Installation	$ 500.00			$ 1,000.00	$ -	$ 1,000.00	$ -
DC rapid charging station				2	0	0	0
Flo DC Rapid Charger	$ 40,000.00	/each		$ 80,000.00	$ -	$ -	$ -
Charging station installation	$ 5,000.00	/each		$ 10,000.00	$ -	$ -	$ -
75kva 600v transformer	$ 5,000.00	/each		$ 10,000.00	$ -	$ -	$ -
6/3 Teck Cable	$ 15.18	/m	250 m/system	$ 30.36	$ -	$ -	$ -
Level 2 Charging station				2	0	0	0
Flo Level 2	$ 12,100.00	/each		$ 24,200.00	$ -	$ -	$ -
Charging station installation	$ 5,000.00	/each		$ 10,000.00	$ -	$ -	$ -
6/3 Teck Cable	$ 15.18	/m	250 m/system	$ 7,590.00	$ -	$ -	$ -
Equipment Subtotal ($)				**$ 238,820.36**	**$ -**	**$ 97,000.00**	**$ -**
GST				*$ 11,941.02*	*$ -*	*$ 4,850.00*	*$ -*
PST				*$ 16,717.43*	*$ -*	*$ 6,790.00*	*$ -*
Equipment Costs ($)				**$ 267,478.80**	**$ -**	**$ 108,640.00**	**$ -**

Figure 28 smartphone distribution system building - equipment budget

8.2.4.1.2 Software Development Budget

Development of specialized software will take place during the building stage of this project with financing from Installment 1. A preliminary requirements document was developed and provided to several software development firms in order to receive quotes. Further refinement of the requirements document will be performed in the first year in collaboration with the selected software developer, at which point a precise quote will be received. The allotted financial resources in Installment 1, presented in *Figure 29* below, are anticipated to adequately cover the required software feature development, as established by conversations with each of the contacted firms.

There may be a need, from time to time, to have updates performed on the software platform for a variety of reasons including:

- Maintaining compatibility with newer operating systems
- Increasing feature deployment
- Bug patching
- Other unforeseen issues

For this reason, an annual software maintenance budget has been assigned and is allotted for dispersion in Installment 2 and 3.

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Software Development Costs

Category	Value	Units	Qty	Installment 1	Installment 2	Installment 3	Installment 4
Software Development							
Online marketplace, packaging and distributi	$ 250,000.00			$ 250,000.00	$ -	$ -	$ -
Maintenance							
Annual software updates	$ 25,000.00			$ -	$ 25,000.00	$ 50,000.00	$ -
Software Development Subtotal ($)				$ 250,000.00	$ 25,000.00	$ 50,000.00	$ -
GST				*$ 12,500.00*	*$ 1,250.00*	*$ 2,500.00*	*$ -*
PST				*$ 20,000.00*	*$ 2,000.00*	*$ 4,000.00*	*$ -*
Software Development Total ($)				**$ 282,500.00**	**$ 28,250.00**	**$ 56,500.00**	**$ -**

Figure 29 smartphone distribution system building - software budget

8.2.4.2 Operating Budget

8.2.4.2.1 Vehicle Budget

As with any vehicle, electric vehicles have operating costs that must be accounted for. *Figure 30* outlines a budgetary list of these anticipated costs.

The electricity cost is calculated based on an assumed 200km travel per day per vehicle, operation of distribution services for 250 days of the year, and 0.16 kwh/km (the electric vehicle analogue for fuel economy; liters/100km or miles/gallon). Based on these numbers, and the anticipated number of vehicles on the road performing deliver activities, the costs are identified in the table below.

There are less maintenance activities with electric vehicles than with conventional vehicles because there are no oil changes, engine cooling systems, fuel filters, or emissions systems. As such, maintenance activities are anticipated to include brake pad changes, tire rotations, and wiper blade replacements, for which $500/year has been allotted. Tire changes are anticipated at the 100,000 km mark on each vehicle, and so this expense has been budgeted according to anticipated annual travel.

Miscellaneous consumables, such as wiper fluid and car washes have been assigned a value of $500/year for the duration of vehicle operation.

Given that each driver will utilize a tablet installed in the vehicle to provide delivery instruction, and those instructions will be dispatched over the internet, each vehicle will need an internet connected tablet. The carrier cost associated with this data plan is included below based on list prices and the anticipated data allotment.

Vehicles

Product		Value	Units	Qty	Installment 1	Installment 2	Installment 3	Installment 4
Total vehicles					0	2	4	4
Electricity	(200km/day, 250days/year)	0.16	kw*h/km	50,000 km/vehicle/year	$ -	$ 581.69	$ 2,544.77	$ 959.63
Maintenance	(brakes, tire rotation, wiper blade	$ 500.00	/vehicle/year		$ -	$ 750.00	$ 3,000.00	$ 1,000.00
Tires	(100,000km replacement interval)	$ 1,000.00	/vehicle		$ -	$ -	$ 2,000.00	$ -
Consumables	(wiper fluid, car washes, etc)	$ 500.00	/vehicle/year		$ -	$ 750.00	$ 2,916.67	$ 1,000.00
Cell phone plan for tablet		$ 80.00	/vehicle/month		$ -	$ 1,440.00	$ 5,600.00	$ 1,920.00
Vehicles Subtotal ($)					$ -	$ 3,521.69	$ 16,061.44	$ 4,879.63
GST					*$ -*	*$ 176.08*	*$ 803.07*	*$ 243.98*
PST					*$ -*	*$ 281.74*	*$ 1,284.91*	*$ 390.37*
Vehicles Costs ($)					$ -	$ 3,979.51	$ 18,149.42	$ 5,513.98

Figure 30 smartphone distribution system operation - vehicle budget

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8.2.4.2.2 Labour Budget

Each vehicle will need a driver, and so, based on estimated salary requirements for this role, and the number of planned vehicles, the following budget has been assigned. *Figure 31* assigns a salary to this individual and identifies the number of employees that will be supported through each installment.

Labour						
Category	Value	Units	Installment 1	Installment 2	Installment 3	Installment 4
Drivers			0	2	4	4
Driver salary	$ 40,000.00	/driver/year	$ -	$ 60,000.00	$ 233,333.33	$ 80,000.00
Labour Costs ($)			$ -	$ 60,000.00	$ 233,333.33	$ 80,000.00

Figure 31 smartphone distribution system operation - labour budget

8.2.4.3 Income Budget

There is a small amount of revenue anticipated to come from the level 3 electric vehicle charging stations as outlined in *Figure 32*. For budgeting purposes, the number of customers has been estimated on a monthly basis. Income is calculated based on the difference between the cost of energy delivered and the selling price on an hourly basis. Refinement of this pricing model will take place as actual usership rates are established and infrastructure is operational. Is should be noted that the purpose of this piece of infrastructure is not principally to serve as a revenue source. Its purpose is primarily to enable the rapid re-energizing of distribution vehicles and secondarily to provide a value-add service, charging of future community vehicles, to the Smart Farm customers as well as other customers of the Otineka mall. The pricing structure will reflect these goals and so this revenue is critical to the sustained operation of the Smart Farm and smartphone distribution system.

Charging Stations						
Category	Value	Units	Installment 1	Installment 2	Installment 3	Installment 4
Customers/year			25	67	336	150
Energy / year (kwh/year)		50 kwh/customer (avg)	1,250	3,350	16,800	7,500
Energy price ($/kwh)			$ 0.04	$ 0.04	$ 0.05	$ 0.05
Energy Cost			$ 51.35	$ 150.50	$ 328.39	$ 657.24
Charge price ($/h)			$ 10.00	$ 11.00	$ 11.00	$ 11.00
Gross Income			$ 250.00	$ 704.00	$ 1,430.00	$ 2,574.00
Charging Station Income ($)			$ 198.65	$ 553.50	$ 1,101.61	$ 1,916.76

Figure 32 smartphone distribution system operation - income budget

8.2.5 Biometric Feedback Study

The following budget, *Figure 33*, is a complete budget for the smartphone distribution system. Unlike the other two activity budgets, the development stage of this study is not anticipated to incur any costs other than the labour of the project manager. Consequently, this budget only includes the implementation stage of the biometric feedback study by broking it down to a list of equipment expenses and operating expenses, including labour (hard expenses and soft expenses). Detailed descriptions follow.

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Biometric Feedback Study *Budget Summary*					*Installment 1*	*Installment 2*	*Installment 3*	*Installment 4*
					$ -	*$ 172,500.00*	*$ 1,113,450.73*	*$ -*
Implementation Costs								
# Study Patients					0	0	224	0
Equipment								
Product		**Value**	**Units**	**Qty**	**Installment 1**	**Installment 2**	**Installment 3**	**Installment 4**
Dexcom								
Transmitter	(3 month replac	$ 389.00	/box (3 months)/patient		$ -	$ -	$ 80,912.00	$ -
Sensor	(monthly boxes)	$ 340.00	/box (1 month)/patient		$ -	$ -	$ 212,160.00	$ -
Equipment Subtotal ($)					**$ -**	**$ -**	**$ 293,072.00**	**$ -**
GST					*$ -*	*$ -*	*$ 14,653.60*	*$ -*
PST					*$ -*	*$ -*	*$ 23,445.76*	*$ -*
Equipment Costs ($)					**$ -**	**$ -**	**$ 331,171.36**	**$ -**
Operating								
Category		**Value**	**Units**	**Qty**	**Installment 1**	**Installment 2**	**Installment 3**	**Installment 4**
Healthcare (# patients)								
# Nurses					0	0	2	0
# Phlebotomist					0	0	1	0
Nurse salary		$ 100,000.00	/nurse/year	2 /year/nurse	$ -	$ -	$ 350,000.00	$ -
Phlebotomist Salary		$ 50,000.00	/person/year	1 /year/phlebotomist	$ -	$ -	$ 54,166.67	$ -
Healthcare visit consumables		$ 20.00	/patient/month		$ -	$ -	$ 4,480.00	$ -
Lab fees		$ 50.00	/patient/month		$ -	$ -	$ 11,200.00	$ -
Patient Incentive		$ 300.00	/patient		$ -	$ -	$ 67,200.00	$ -
UofM research contribution		$ 150,000.00	/year		$ -	$ 150,000.00	$ 150,000.00	$ -
Operating Costs ($)					**$ -**	**$ 150,000.00**	**$ 637,046.67**	**$ -**
Total Costs ($)					**$ -**	**$ 150,000.00**	**$ 968,218.03**	**$ -**
Buffer		*15%*			*$ -*	*$ 22,500.00*	*$ 145,232.70*	*$ -*
TOTAL BUDGET - Biometric Study ($)					***$ -***	***$ 172,500.00***	***$ 1,113,450.73***	***$ -***

Figure 33 biometric feedback study detailed budget

8.2.5.1 Implementation Budget

8.2.5.1.1 Equipment

Continuous Glucose Monitoring wearable technology is the sole equipment cost for the implementation of the biometric feedback study. At time of writing, Dexcom G5 is the only product available in the Canadian market that provides this functionality, although there are several additional equipment suppliers on the horizon. Therefore, the following prices are included in the budget based on a quote provided by Dexcom.

There are two components required for operation of this technology; a transmitter and an adhesive sensor patch that must be fastened to the torso of the subject. Adhesive sensor patches are priced at $340 per box and a box is anticipated to last for one month of operation. The transmitter, which physical attaches to the sensor and, via a Bluetooth connection, transmits data to the subject's smartphone, lasts three months before requiring replacement and costs $389. The total of these costs, along with the preliminary estimate of the total number of study participants that will be wearing these devices, is identified in *Figure 34* below.

The preliminary biometric feedback study design, developed during the finalist phase of this project, requires that participants wear the CGM system for six weeks. This is the minimum required interval for the collection of statistically significant data. However, in the interest of maximizing the value add to the community from each transmitter, a complete three-month supply of sensors has been budgeted for, so that study participants can be provided with an additional six weeks of real-time biometric feedback. This is done in the intention of further establishing knowledge of the connection between diet and diabetes among the study participants and with the hopes of spreading that message to the greater community.

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# Study Patients					0	0	224	0
Equipment								
Product		**Value**	**Units**	**Qty**	**Installment 1**	**Installment 2**	**Installment 3**	**Installment 4**
Dexcom								
Transmitter	(3 month replac	$ 389.00	/box (3 months)/patient		$ -	$ -	$ 80,912.00	$ -
Sensor	(monthly boxes)	$ 340.00	/box (1 month)/patient		$ -	$ -	$ 212,160.00	$ -
Equipment Subtotal ($)					$ -	$ -	$ 293,072.00	$ -
GST					$ -	$ -	$ *14,653.60*	$ -
PST					$ -	$ -	$ *23,445.76*	$ -
Equipment Costs ($)					$ -	$ -	$ 331,171.36	$ -

Figure 34 biometric feedback study implementation - equipment budget

8.2.5.2 Operating Budget

The biometric feedback study will be conducted by University researchers in collaboration with healthcare providers at the local healthcare centers. This budget, outlined in *Figure 35* below, accounts for hiring two contract nurses to provide healthcare support to study participants, both during the study and for a six-month period following the study. A phlebotomist will be needed for collection of blood samples from study participants on a regular basis for laboratory analysis of diabetes markers beyond blood sugar. Budgeting for a phlebotomist, as well as laboratory fees and healthcare visit consumables (example: needles, Band-Aids, and sterilization supplies) is budgeted for to minimize the financial burden on local healthcare facilities and ensure successful implementation of the biometric feedback study.

Study participants will be required to carry a smartphone with a data connection throughout the study process, as well as drive themselves to and from their appointment. To cover these costs, as well as provide an incentive to the participants, $300 has been budgeted per person to cover these costs. Based on community engagement survey results, discussed in Chapter 6, those community members that were interested in participating in a biometric feedback study identified fresh food as the most desired incentive to compensate participation. The cost of this has been accounted for in the Smart Farm section.

Operating								
Category	**Value**	**Units**	**Qty**	**Installment 1**	**Installment 2**	**Installment 3**	**Installment 4**
Healthcare (# patients)							
# Nurses				0	0	2	0
# Phlebotomist				0	0	1	0
Nurse salary	$ 100,000.00	/nurse/year	2 /year/nurse	$ -	$ -	$ 350,000.00	$ -
Phlebotomist Salary	$ 50,000.00	/person/year	1 /year/phlebotomist	$ -	$ -	$ 54,166.67	$ -
Healthcare visit consumables	$ 20.00	/patient/month		$ -	$ -	$ 4,480.00	$ -
Lab fees	$ 50.00	/patient/month		$ -	$ -	$ 11,200.00	$ -
Patient Incentive	$ 300.00	/patient		$ -	$ -	$ 67,200.00	$ -
UofM research contribution	$ 150,000.00	/year		$ -	$ 150,000.00	$ 150,000.00	$ -
Operating Costs ($)				$ -	$ 150,000.00	$ 637,046.67	$ -

Figure 35 biometric feedback study implementation - operating budget

8.3 Financial tools and methodologies

The Smart Farm will be utilizing Cash Basis Accounting: income is recorded when it's received, and expenses are reported when they're actually paid. We will record revenue when a customer pays for a product and will record a payable when it is paid.

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Financial administration associated with building and operating the Smart Farms will be aided by the utilization of QuickBooks Pro. This is a financial accounting software program intended for a business of the size and scale we are considering. With features that are aimed at supporting accounting tasks such as accounts receivable, accounts payable, bank statement reconciliation, payroll and financial reporting, this software is suitable for our purposes. Specifically, this software allows us to complete the following tasks:

Money Management:

All recurring invoices and payments with their due dates and transaction detail can be keyed in. Cheques can be printed directly through QuickBooks and every transaction is documented, making future audit reports easily accessible. Additionally, the Smart Farm bank account can be connected directly to QuickBooks should we wish to utilize that option.

Sales Invoicing:

One of the sources of revenue, besides sales to community members, will be to service customer contracts for cash crops such as herbs, which are in growing demand. QuickBooks will allow us to track sales and generate receipts and invoices instantly. These invoices can be electronically delivered which saves on administrative time.

Financial Reporting:

QuickBooks will allow us to generate financial reports specific to the topic required including year-over-year income, expenditures, trends and forecasting documents. All reports can be exported to the Tri-Council membership and Board of Directors should they request these at any time, including for Board meeting preparation. These up to date reports impact the ability of the Board to make decisions based on real time facts.

Ease of Use:

QuickBooks has been selected as the accounting software of choice because it is user-friendly and uncomplicated.

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SMART CITIES CHALLENGE BUDGET				
Expense Category	**Description**	**$ Amount**	**TOTAL**	**$ Balance**
				$250,000.00
Service Contracts	• Proposal development (2) • Videographer • Community Engagement • Communications • Legal Fees	$ 130,200.00 $ 10,500.00 $ 3,000.00 $ 3,840.00 $ 1,695.00	$149,235.00	$100,765.00
Travel & Accommodation	• Winnipeg – The Pas/OCN & Toronto Jury Check-in	$ 11,212.43	$ 11,212.43	$ 89,552.57
Hospitality and Meeting fees	• Tri-Council, Project Team meetings • Information Sharing, update meetings • Smart Cities Challenge team visit	$ 503.30		$ 89,049.27
Webpage Development	• Infrastructure Canada and public access to proposal and video	$ 500.00		$ 88,549.27
Administration	• Printing, financial, meeting space, staff hours	$ 10,000.00	$ 10,000.00	$ 78,549.27
Estimated Costs for Showcase Ottawa May 14, 2019	• Travel for project team • Display costs • Food/Accommodations • Taxis	$ 35,000.00	$ 35,000.00	$ 43,549.27
Project Wind-up Activities*	• Leadership to Determine	$ 43,549.27		

*unallotted funds at time of proposal submission

Tri-Council leadership jointly signed a Funding Authorization Process which detailed how spending of monies from the finalist contribution would proceed.

A project team was established consisting of a representative from each of the governments, as well as a project proposal manager and a project proposal coordinator. These five individuals carried the responsibility to ensure completion of the proposal and to ensure all criteria were met. All financial requirements were compiled by the proposal coordinator and forwarded to the three government representatives for approval. All service contracts were signed by these three individuals. An invoice was

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created for each expense and forwarded to the Opaskwayak Health Authority finance department who have held the finalist contribution money on behalf of the Tri-Council. All cheques were processed by the finance committee and signed by two authorized personnel. Monies were maintained in a chequing account established solely for the purpose of housing the finalist contribution.

Details on the expense categories listed in the table above are as follows:

1. Service Contracts: all individuals requested to work on the development of this proposal, besides the government representatives who were not paid for this work, were hired on a contract basis.
    - Two individuals were the primary proposal writers. They travel between Winnipeg and the Tri-Council region on a regular basis and increased their travel for this project. Their roles included developing and coordinating all aspects of the proposal including the regular calls with the Smart Cities team and hosting the in-community visit of the team representatives, participating in all webinars hosted by the Smart Cities team, preparing for and travelling to Toronto for the jury check-in, writing all contracts for other service providers, preparing presentations to the government bodies and the Tri-Council, working with the videographer to complete the mandatory 5 minute video, working with the community engagement personnel in completing the preparation of surveys and other community engagement strategies, developing the plan and all aspects of the proposal, responding to media, and keeping everyone informed of communications, and working with the lawyer to develop the governance structure. These individuals will also be responsible to prepare for the showcase event in Ottawa in May 2019 and to travel to Ottawa with the project team at that time.
    - One individual was hired to produce the 5-minute video. The individual lives and works in the community and came highly recommended by the project team and community members. He photographed and interviewed a wide range of people; the inclusiveness and professionalism are noted in his final submission.
    - One individual was hired to complete community engagement activities on behalf of the project. She lives and works in the community and was able to complete extensive engagement activities during the initial proposal period as well as during the finalist period of this Challenge.
    - One individual has been hired for communications, including creating agendas and materials to present to the Tri-Council governments, and ongoing relationship development among communities.
    - A lawyer was hired to create the not for profit corporation as the form of governance structure that was agreed to by the Tri-Council as the best model for implementation of this project. Onekanew (Chief) Sinclair of OCN suggested the use of the lawyer preferred by OCN and it was this lawyer that was used for the development of the articles of incorporation.

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2. Travel and Accommodation: This cost category included all travel and accommodation that was required by the project coordinator and project manager to complete the tasks requested of them as detailed in their description of services above. The amount is impacted by the northern remote location of the Tri-Council region.
3. Hospitality and Meeting fees: This cost category included costs associated with meetings of the project team, Tri-Council, hosting the Smart Cities Challenge team community visit and strategic planning meetings. Items included food, logo printing, and printed presentations.
4. Webpage Development: This cost category reflects the funds utilized to pay an individual to develop the webpage that contains the links to the final proposal submission and the finalist video.
5. Administration: Opaskwayak Health Authority incurred costs associated with staff time to establish and maintain the bank account, process invoices, prepare and deposit cheques, cover printing costs for materials, arrange for and provide meeting space, locate and provide documents pertaining to the existing OCN Smart Farm, provide staff time for interviews and expertise. A standard 10% administration fee has been allotted for these services.
6. Estimated Costs for Showcase Ottawa May 14, 2019: The project team has determined that five people will be attending the showcase in Ottawa. Costs associated with return travel from the Tri-Council region to Winnipeg and then on to Ottawa, as well as those required to set up the trade style display, are reflected in this cost category.
7. Project Wind-up activities: While currently unallotted, the remainder of the monies will be utilized for final legal fees and other costs associated with the completion of the proposal phase and moving into the implementation phase of the project.

8.5 Risk Identification and Mitigation

Risks and mitigating techniques are discussed within the narrative of the comprehensive budget review above.

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9 CHAPTER 9: IMPLEMENTATION PHASE REQUIREMENTS

9.1 Duty to Consult and Modern Treaty Obligations

In Canada, we have recognized in the Constitution Act of 1982 that in affairs of the Crown, also known as the federal, provincial and territorial governments, that we have a duty to consult with Indigenous peoples when contemplating actions or decisions that may impact our Indigenous peoples. The Smart Cities Challenge is an initiative of the federal government and the Tri-Council within this proposal is contemplating a project that may be implemented in the event the Tri-Council is successful in the challenge.

The project we are proposing as a Tri-Council has a unique structure in that one of the three governments comprising the Tri-Council is Opaskwayak Cree Nation; a First Nation signatory to Treaty #5. The Friendship Accord among the three governments has been in effect since 2014. The governance structure identified in Chapter 5 of our proposal is the first formalized structure created by the Tri-council. This not for profit corporation will have equal representation from each of the three governments. While the articles of incorporation are standard, our unanimous member agreement outlines a list of items which require approval by Extraordinary Resolution. "Extraordinary" approval requires an 80% agreement threshold, so for all intents and purposes, the requirement is unanimity meaning no one voice can be silenced. Therefore, upon our success in this challenge and as our project proceeds, Opaskwayak Cree Nation, The Town of The Pas, and the RM of Kelsey will have equal voice at decisions made by the Board of Directors.

The national voice in Canada supports reconciliation with Indigenous peoples in Canada for the injustices of the past. We each carry a personal responsibility to move towards inclusiveness in our country. It is within the richness of inclusiveness, working together as we respectfully listen to the ideas and opinions of each other, that we can rise to greatness and achieve together what we could never achieve alone. The work of the Tri-Council demonstrates this move towards reconciliation at a local level. As we work together on issues that impact our communities, we are learning more about each other – our differences and our similarities. The Smart Cities Challenge project has provided another opportunity to know each other and to embrace our cultural diversity and the richness this brings to our communities.

9.2 Community Employment Benefit (CEB)

- The CEB is a federal initiative that requires implicated projects, such as that described in this proposal, to provide employment and/or procurement opportunities for at least three of the groups identified below. Tri-Council leadership publicly voices their intentions to continue to grow a stronger and more inclusive community by building on successes of the past. Our view is that providing diverse employment opportunities, as outlined in the CEB guidelines, are as innovative and important to our prosperity in the future as is the use of technological innovation. As the project unfolds, it is anticipated that the following groups will be included as our targeted community employment beneficiaries.

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- Indigenous peoples – the current vertical smart farm is located on Opaskwayak Cree Nation (OCN) and all current employees are Indigenous. Our expanded smart farm location is also on OCN land and all employment opportunities will be posted in OCN as well as the other partnering communities.
- Women – the current Manager of the smart farm and Chief Technician are women. They will be vital to the skills, training and procurement for the expansion of the smart farm. We anticipate that women will continue to seek employment and be strong leaders in this business as throughout this project.
- Veterans – veterans will be encouraged to apply just as all community members are
- Youth – dietary change begins with the youth. It is our plan that youth be integrated i operations of the smart farm, beginning with school tours and continuing into employ opportunities, particularly summer term positions while they are students and on to f they chose opportunity for employment at this location.
- Recent immigrants – there are increasing numbers of immigrants to the Tri-Council re submissions for employment will be met with the same enthusiasm as all other community members.
- Small/Medium enterprises – we have listed in Chapter 5 that our agricultural technology partnership and supplier is the OCN LED Smart Farm. Our smart farm expansion will bring direct financial gain to this enterprise. Others may follow as the project unfolds.

Upon success of our challenge and the funding decision, we will provide specific targets for each of these identified employment benefit groups.

9.3 Climate Lens Assessment (CLA)

As instructed by the Smart Cities Challenge team, we are asserting that the total cost of our project with a primary focus on climate change adaptation, resilience, disaster mitigation, or a reduction in GHG emissions is less than $10 million.

9.4 Risk Identification and Mitigation

1. Unequal voice at the governance table
   - Mitigation: Inclusive governance structure with legal items to ensure unanimity as detailed in Chapter 5.
2. Identified groups for CEB are uninterested in employment at the Smart Farm
   - Mitigation: widespread dissemination of job postings; provide adequate training; ensure salaries meet industry standards; ensure administrative protocols in place to foster a supportive work environment.

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AGORA

Smart Cities Challenge

Final Proposal

March 5, 2019

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EXECUTIVE SUMMARY

As a group of four rural counties in Alberta, we are pleased to submit our proposal to Smart Cities Canada! We believe we have risen to your Challenge.

When awarded the Challenge prize, we aim to transform how rural Canada uses and accesses Information Communications Infrastructure for the common good. We will lever the benefits of connected technologies to improve rural lives, rural economies and rural environments. We will bridge the divide with urban Canada and better connect urban residents with their sustainable food supply. We seek to create a region where internet connectivity, smart technologies, and innovative data trust applications are developed and used to increase rural prosperity and will attract citizens to an innovative and prosperous way of life.

We are about to embark on a path to tackle one of Canada's most wicked of problems:

> *Deliver decision-making tools, informed by hyper-local data and connectivity solutions, that benefit residents that, in turn, improves Canada's food production and distribution system, enhances rural safety and security, incents young families to become life-long farm operators, and, when fully implemented, increases the prosperity of rural Canada.*

The challenge is large – our plan begins the process. It delivers upon the outline submitted in the Spring of 2018, and builds upon it in significant ways. A full strategic plan, with all the supporting details demanded through this rigorous application process, defines our way forward.

We propose a not-for-profit company reflecting our rural intent – ***AGora*** – be created to bring life to our strategy.

> ***AGora*:** an internet enabled meeting and marketplace, based on the original Greek agora where people meet, discuss, research, resolve, profit and prosper.

True to the intention of the Smart Cities Challenge, we are focussed on delivering value that can be adopted nationwide. We intend to use state of the art technologies to create *AGora* so it can be used by others. And it has not and will not be created in isolation. Collaboration underpins our achievements so far, and will be core to our long-term success. Community members and partners of all types will work with us to deliver value.

Our proposal defines a common purpose and shared approach to tackle our 'wicked problem' head on, and not wait for events to overtake rural Canada. We see a positive future for all rural regions in Canada, with connected technologies at the core.

We ask that you step forward in partnership with us to bring about a new future for Rural Canada. Something that perhaps was not contemplated when the Smart "Cities" Challenge was announced, but something that will deliver fundamental value to Canada's urban and rural residents alike.

We invite you to join us!

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VISION

1. The Four-County Challenge

This proposal sustains the collective vision of Parkland, Brazeau, Lac Ste. Anne and Yellowhead counties in Alberta to create a smart rural region and describes how this will be achieved.

The proposal continues to focus on the collaborative Challenge that:

Our agricultural community will revitalize and grow through the connection of people to the land and food while attracting citizens to share in its prosperous, innovative and resilient way of life.

Our four counties envision a growing local populace that is positioned to succeed in the digital economy. Economic growth and population growth will require access to the Information and Communications Technology (ICT) economy and the decision tools required to prosper.

Our objective is to create a region where internet connectivity, smart technologies, and innovative data trust applications are developed and used to create a more prosperous agricultural economy, protect and improve the environment, enhance rural quality of life, increase safety and security, and provide leading-edge connectivity for our farms and citizens.

Rural Economy

The initiative will create a rural economy where opportunities expand, stronger links to urban markets support and diversify the economy, smaller farms are more viable, larger farms use precision agriculture to improve productivity and increase profitability, and increased opportunity and prosperity enable intergenerational farm transfer.

Rural Environment

The initiative will enable decisions that protect and improve the environment and husband the region's natural assets and land base. This includes identifying new end-uses for waste that is now being landfilled, efficient use of agricultural/residential by-products and green energy opportunities.

Rural Quality of Life

The initiative will enhance rural quality of life by creating communities with a more diverse age demographic, helping smaller farms to establish and prosper, increasing agricultural diversity, attracting residents with different social and economic interests, expanding the tax base to upgrade infrastructure, and increasing mental health as incomes grow and financial challenges are eased.

Rural Safety and Security

The initiative will make the region safer and more secure by improving road safety, reducing the incidence and severity of rural crime, and improving response times for law enforcement.

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Rural Connectivity, Dataflow, and Data Trust

The initiative will provide leading-edge connectivity, where technology enables people to live further from urban centres, obtain equitable service, and derive more value from the agricultural data it produces, via a secure and fully auditable data exchange and trading platform.

Data protection has emerged as a factor critical to the long-term prosperity of communities. Data is the new enterprise currency – the ability to collect, analyze and lever it for the benefit of the data provider will distinguish one enterprise from another. This is no less so in the agricultural sector. Deriving value from this 'second crop' will be achieved by combining a single piece of data with other data and then generating more data – an evergreen crop. This virtuous cycle will help solve real-world farm management problems, provide new revenue sources and identify and solve community problems quickly and easily.

2. The Proposed *AGora*

We are proposing to incorporate a not-for-profit organization that will act as a rural innovation incubator, bringing together partners from all sectors to catalyze early adoption and use of high-speed internet communications, smart technologies, and innovative internet applications.

We are calling this new entity *AGora*.

AGora will establish the infrastructure required to provide a test platform for:

- Experimenting with new technologies and models for rural internet connectivity
- Supporting innovation in agricultural technology and agricultural practices
- Creating new applications that support rural citizens, communities, and businesses
- Protecting and monetizing data through new technologies on behalf of data producers

AGora will:

- Establish a data trust to ensure control and sovereignty of the data assets
- Deliver hyper-local data and analytics to provide value and incent participation
- Recruit an initial cohort of farmers, local businesses and rural farm-based businesses who wi provide their operations as a test bed for technology development and continuous improver will provide high-speed connectivity for these early adopters
- Recruit technology developers who will benefit from and are willing to pay for access to thes adopters help create new technologies on highly-connected farms
- Use revenues from this 'pay-to-play' model to extend connectivity to others in the region

Clear vision, app. est. if ors.

Through its activities, *AGora* will:

- Develop an affordable model for rural digital connectivity that can be replicated in other rural regions
- Develop made-in-Canada innovations in smart agricultural technology
- Accelerate adoption of new agricultural practices that improve farm productivity and profitability
- Catalyze development of internet-based applications that enrich rural life
- Improve urban Canada's understanding of its food production and security system
- Establish data as a 'second crop' for farmers that is renewable, expandable and profitable

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Data will be *AGora's* stock-in-trade. It is the critical focus of every product and service supported by *AGora*, which will provide content that is the most relevant, timely and valuable for regional agricultural producers and other clients. This focus on data will help *AGora* and its clients capitalize on these rich and comprehensive data resources that many commercial enterprises already exploit. Increasingly, agriculture producers and the broader population are coming to understand they have been supplying these and other private enterprises with useful and marketable data, with virtually no direct return. *AGora's* efforts to cultivate leadership in rural innovation will focus on improving digital and data literacy throughout the region and will build *AGora* and client capacities for data discovery, data science, data marketing, data brokering, and other profitable functions related to the lucrative and expanding global data economy.

3. Meeting Real Community Needs

3.1. Community Consultation and Engagement

This initiative will create outcomes that are highly relevant for the four-county region and its residents. These outcomes represent real community needs that have been refined through extensive consultation and engagement. The processes used to develop our vision and prepare this implementation plan are described in the ENGAGEMENT chapter.

3.2. Supporting Evidence

There is significant supporting evidence for the relevance of our key strategic objectives and the benefits of addressing this Challenge.

Rural Economy

Farms are getting larger, numbers are dwindling, and wealth is accumulating in the largest. In Alberta, the average age of farm operators increased from 48.2 years in 1996 to 55.7 in 2016. It is more difficult for young people to enter the agriculture business and to stay in business; farms are expanding instead of diversifying.

Where able, rural residents are enthusiastic adopters of new technology. Farmers always have had to figure out how best to market their products. Today, 12.7% of Canadian farms use direct marketing tools to access markets. This is more the case for small farms than large - 25.2% of farms with sales less than $10,000 use direct marketing, compared with 5.6% of farms with $1 million or more. Small farms rely on direct marketing, on-line presence, and ability to reach the 'farm-to-fork' audience.

Larger farms are becoming equally dependent on technology. Precision agriculture is data intensive and requires high-bandwidth connectivity. A futurefarming.com survey – "Internet speed hinders farm technology use in Canada" – found 93% of respondents felt precision agriculture was useful; three-quarters plan to expand their use of the technology in the future. However, according to the report, the biggest barrier to further technology adoption, after price, is internet infrastructure.

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Rural Environment

Soil erosion is a significant challenge that is costing Canadian farmers more than $3 billion a year, notwithstanding the efforts that have been made in soil conservation. University of Manitoba professor David Lobb says in 1971 farmers lost $0.96 billion in 2016 dollars every year due to soil erosion. In 2011, he says, this had increased to $3.18 billion, resulting in cumulative losses of between $40 billion and $60 billion. ["Cost of soil erosion $3 billion annually in Canada." Chatham this Week. Tom Morrison. Feb 20, 2018.]

Continuous cropping and the use of agrochemicals have increased crop yields but also may impact long-term sustainability. Increased availability of hyper-local data coupled with improved data-mining and artificial intelligence will enhance each farmer's ability to make responsible decisions by better understanding of environmental processes at various scales, improving land stewardship.

Rural Community and Quality of Life

In its 2017 report titled Rural Broadband: *Policy Recommendations for Improving Broadband Access & Adoption in Rural Alberta*, the Alberta Centre for Sustainable Communities at the University of Alberta advocated that "broadband should be considered a priority for community development and an important space for interaction and innovation."

A paper published in American Behavioral Scientist in 2010 summarized research indicating that internet usage can increase voluntary participation and create social networks in rural communities, building social capital. ("Do Rural Residents Really Use the Internet to Build Social Capital? An Empirical Investigation." Michael J. Stern and Alison E. Adams. American Behavioral Scientist. 53(9) 1389–1422.)

The authors assessed how residents in an isolated rural region of the western United States used online connections to maintain local social networks and learn about community events and organizations. They concluded Internet usage can play an important role in strengthening rural communities. Residents used the Internet both to learn about local events and groups (bonding) and to connect to interests outside the local area (bridging).

Rural Safety and Security

Farms (and municipalities) are using larger and more advanced equipment. Their size and speed make them a hazard on public roads. As rural road traffic increases so does the accident rate. A 2016 study – "The effects of roadway characteristics on farm equipment crashes: a geographic information systems approach" – in the Journal of Epidemiology confirmed that "As traffic volume increased, the odds of a crash occurring also increased. Higher traffic volume, higher posted speed limits, road type, and smaller road widths were associated with the occurrence of farm equipment crashes."

Rural crime also is a growing problem. Western Canada has higher rural crime rates than tl average. Alberta, with 9,895 offenses per 100,000 residents, places third in the west. The Caucus on Crime Reduction in Saskatchewan (2017) reported that "there has been a reloc traditionally urban crime to increasingly rural areas. The result is that drugs, gangs and vio are more prevalent in rural parts of the Province." Rural residents feel criminals are becom brazen, better organized, and more brutal.

Continuing research

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Rural Connectivity

Canada has recognized the importance of nationally available broadband. The CRTC has confirmed that, notwithstanding significant improvements, "many Canadians, particularly in rural and remote areas, do not have access to broadband Internet access services that are comparable to those offered to the vast majority of Canadians in terms of speed, capacity, quality, and price." In its Telecom Policy 2016-496, the CRTC said it "expects fixed broadband Internet access services... to be available in 90% of Canadian premises by the end of 2021, and in the remaining 10% of Canadian premises within 10 to 15 years. In communities where distance, geography, and limitations to existing technologies present challenges, the Commission expects that intermediate steps will be taken to progress towards these goals."

Service in our four regions is currently spotty and irregular. In a survey conducted for this project 93% of respondents rated cellular coverage as average-to-poor; 77.3% rated internet coverage as average-to-poor. Moreover, as part of this project Taylor Warwick confirmed that fully $100.7M would be required to implement traditional connectivity across the four counties on par with urban Canada.

Meaningful Data Creation and Use

Smart farming relies on new technologies like the Internet of Things, cloud computing, robotics, and artificial intelligence. Massive volumes of data are captured, analyzed, and used for decision-making. The global data economy is pegged at $3 trillion - a rising trend that also is evident in agriculture.

Climate Corporation's Chief Science Officer estimates 70% of agricultural yield is related to what to plant, how to fertilize, and how to protect the crop. According to equipment manufacturer John Deere, self-guided systems now farm approximately 60% to 70% of the crop acreage in North America, 30% to 50% in Europe, and more than 90% in Australia.

Monsanto paid nearly $1 billion dollars to acquire The Climate Corporation in 2013. There is a growing global market for tools that use Big Data to produce actionable insights.

In "A future internet collaboration platform for safe and healthy food from farm to fork" [Global Conference (SRII), 2014 Annual SRII, IEEE, San Jose, CA, USA (2014), pp. 266-273], Sjaak Wolfert and his co-authors identified five main challenges:

- Handling increasingly large amounts of data from all kinds of agricultural equipment
- Establishing interoperability between various systems at farm level and in the whole supply chain network surrounding the farm
- Standardizing data
- Going beyond the small scale and regional focus of farm software development
- Complying with national and regional differences in farming practices

Beside business players, many public institutions are promoting Big Data applications in farming by advocating for open data and data-driven innovation. Examples include the Big Data Coalition, Open Agriculture Data Alliance (OADA), and AgGateway. The US Department of Agriculture wants to use data created by connected farming equipment, drones, and satellites to enable precision agriculture for food security and sustainability.

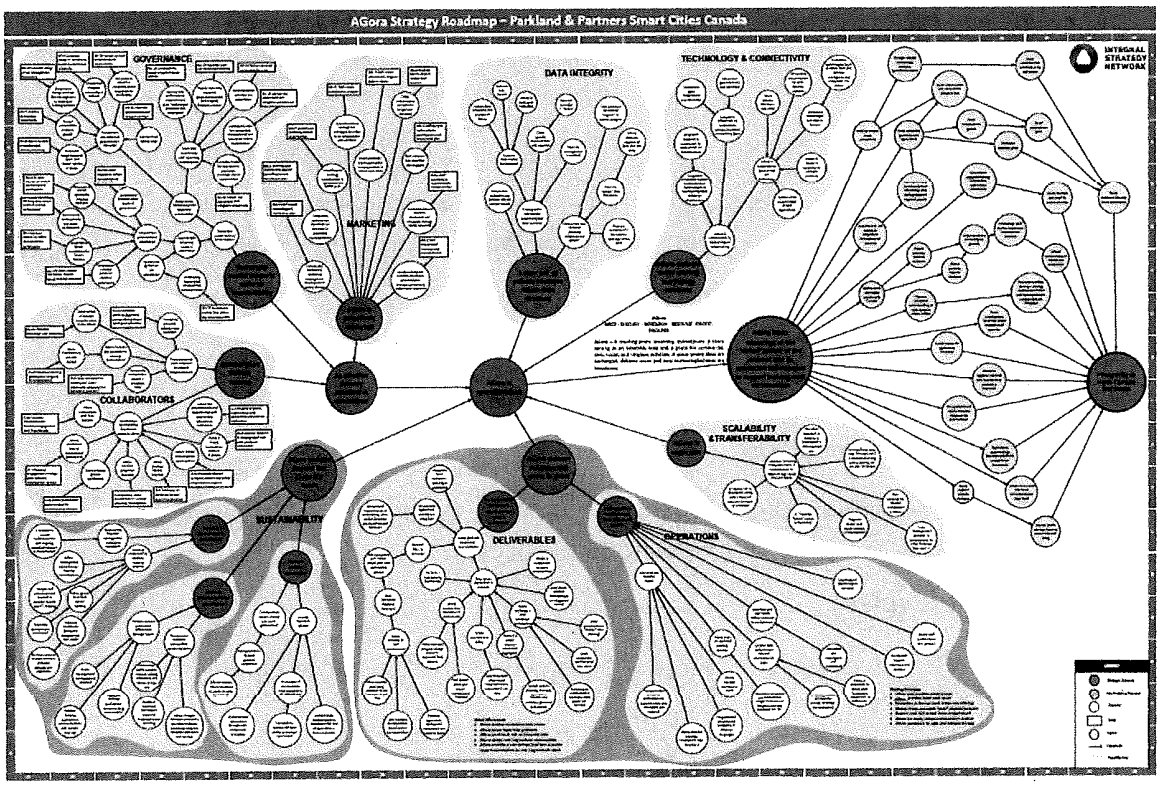
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4. Sustained Progress During the Finalist Phase

The region commissioned an assessment of current communications infrastructure in the four counties during this finalist phase. This provided additional detailed information describing the quality of service, gaps in service provided, and the investment required to meet CRTC service standards. This will provide essential baseline information for setting priorities and developing an infrastructure strategy that will evolve to support this initiative.

Substantial progress also has been made to secure community participation and support. The Integral Strategy™ Roadmap development process involved key community stakeholders who have committed their continuing involvement to move this initiative forward. It has received broad support from other key stakeholders and potential partners, including all cities and towns in the region.

The design process we used focused on results. Collective intentions are described in the Strategy Roadmap we created. The map defines a clear strategic goal, the actions and outcomes required to achieve it, and ensuing benefits. It provides an ongoing framework for disciplined implementation, including priority-setting, assignment of accountability, risk management and performance measurement linked to key outcomes.



Major themes describe requirements to establish *AGora* (governance, collaborators and marketing); creating user value (deliverables and operations); delivering leading technology solutions (technology and connectivity); stewarding data assets (data integrity); ensuring *AGora's* continuing viability (sustainability); and replicating the innovations in other rural regions (scalability and transferability). **The Roadmap delivered the framework used to develop the strategy described in this proposal. (http://integralstrategy.net/wp-content/uploads/2019/03/ParklandStrategyRoadmap.pdf)**

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5. An Ambitious and Achievable Challenge

This is an ambitious initiative aimed at:

- Providing a new and trusted Canadian platform for innovation
- Incenting technology development and commercialization
- Enlisting early adopters to test promising new technologies
- Identifying opportunities to increase productivity and profitability in agriculture
- Strengthening rural communities, farms and businesses
- Delivering new models and technologies to enable rural connectivity

The outcomes are well aligned with the objective of the Smart Cities Challenge to improve the lives of residents in Canadian communities through innovation, data and connected technology. The initiative will improve the quality of life in rural communities and will encourage the next generation of Canadian farmers to continue farming without being disadvantaged by this lifestyle choice.

Notwithstanding the scope of this Challenge, we are committed to achieving it, following a disciplined approach. Objectives will be achieved through strong partnerships, broad community collaboration, sustained commitment over time, and the use of artificial intelligence and distributed technologies to protect the intellectual property of participants.

6. Guiding Principles

AGora will adopt the following principles as the base for corporate operation and growth. They speak to the values of the organization and will guide decision making and setting business priorities.

Our conduct is honest, ethical, and responsible

AGora will not only meet all applicable legal and regulatory requirements, it will operate in a clear, open, and transparent manner in support of the rural and agricultural sector.

Value is created through partnerships

AGora will seek to create greater value through partnerships, recognizing that partners bring unique strengths to initiatives that increase their likelihood of success.

Data ownership delivers value

AGora recognizes that data has become the new enterprise currency and should deliver value for its creators, curators, and users.

Growth and innovation opportunities exist

AGora will pursue opportunities for growth and innovation, recognizing that rural economies and agriculture will benefit from capitalizing on these opportunities.

Successful development is based on knowledge, innovation and growth

AGora is committed to catalyzing innovation in Canada that meets the needs of a rural economy and agricultural base that seeks to remain competitive, diversify and grow.

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Equitable access is fundamental to future opportunity

AGora will strive to deliver region-wide access to connectivity that is competitive with that in urban areas and transferrable to other rural communities across Canada.

First Nation involvement supports success

AGora recognizes that reconciliation and strong, sustainable communities will be achieved through long term engagement with First Nations and being respectful stewards of the lands we all reside on.

Customer service is key

AGora recognizes that its success depends on sustaining a culture that embraces excellence, integrity, accountability, and service to all clients in the four counties and beyond.

Data sovereignty and data trust are paramount

AGora recognizes the importance in the post-Cambridge Analytica era of deploying technology solutions that create a fair balance of power and control between those who produce the data (citizens and farmers) and those who manage the infrastructure or processes and use the data.

7. A Model that is Transferable, Replicable, and Scalable

It is a long-term objective of the Smart Cities Challenge that the investment Canada makes in this region can be replicated, modelled and transferred to other areas of the nation. Canada has advised that the funding provided should enable full national roll-out. *AGora* will demonstrate national scalability, transferability and replicability, anticipating that funding for implementation will come through other avenues.

The Organizational Model

The not-for-profit model used to establish and govern *AGora* will provide full financial accountability and transparency. Details of the model will be fully available to other rural regions that wish to participate with or emulate its services and design. In much the same way that this project leaned on the good works of existing entities like TECTERRA to help with key design elements, *AGora* will provide similar support to other interested parties.

Connectivity Solutions

Rural Canada is disadvantaged by poor internet access and speed compared to that enjoyed in urban areas. *AGora* will conduct pilot projects to determine how existing infrastructure can be twinned with new communications technologies to fundamentally re-structure ICT deployment and service delivery in rural areas and will assess the feasibility of achieving target service levels identified by the CRTC.

The 4 Counties have been broadband leaders since 2009, and have created some of the largest municipally owned infrastructure projects in Western Canada. They continually share best practices.

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The *AGora* Platform

AGora's technology platform will be a web based, GIS enabled, Data Trust platform. It will be designed and architected to transfer, scale and extend to other geographic areas. The platform will enable data analytics, host applications and protect data through the Data Trust. *AGora* will create a feature rich library of products and services focused on solving hyper-local Agricultural problems.

Commercialization of Innovations

We contemplate a long-term and healthy relationship with the private sector. Private sector participation is critical to bring state-of-the-art technologies, broader skills and diverse applications to rural innovation. We expect many of the tools that are developed in *AGora* will be patented and commercialized through private sector participation. National and international replication and dissemination will take place through assertive profit-oriented companies.

An Innovation Transfer Program

AGora will establish a program to transfer innovations created in this region to other rural communities. This will include experience with its structure and governance model, values, operating principles, partnering approach, and community engagement processes. It will seek to establish relationships with other communities.

Extension to Other Rural Sectors

This proposal will create benefits for the agriculture sector and population in the four counties. The region also includes mining, oil and gas, tourism, and forestry. Implementation will improve connectivity and will create a model and technology enablement that can be extended to other sectors. Ultimately, this could include all sectors of Canada's rural economy throughout the country.

Ongoing Assessment

AGora will include ongoing assessment of the effectiveness of these approaches, to improve them and identify new opportunities to transfer findings from *AGora* to other regions. Its AI-backed and secure performance management systems will allow both project benefits and wider economic and social multipliers to be tracked and reported on.

8. Reasons to Select Our Proposal

Our proposal is strong in a number of essential respects – location, enabling conditions, technology design, and the rigor of our approach.

8.1. Location

The region represented by our four counties is ideally suited for this initiative. The site is a natural test bed to prove and develop solutions that can be deployed in other rural regions:

- There is a wide range of agricultural products, processing, and global marketing efforts in the region, and a small investment would deliver significant innovation, economic and public benefits
- Key rural economies are represented: forestry, oil and gas, mining and tourism

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- Agriculture is diverse, ranging in size from large to small, including farms and ranches, and profitable and less profitable operations
- Connectivity is highly varied, with many dark spots
- The terrain presents a variety of communication challenges

The region also is close to a major urban centre – Edmonton. This proximity offers:

- A connection point for high-speed internet access
- Recognized leaders in artificial intelligence (leading city for pan-Canadian artificial intelligence strategy)
- Opportunities to establish creative agri-food partnerships for technology innovation
- A test bed to develop new rural-urban connections and market opportunities

8.2. Enabling Conditions

The following conditions support delivery and adoption.

Local Farmers are Aware of the Need for Change

Farmers are increasingly aware of data-driven agriculture, and the impact this will have on their lives, their ability to make decisions, and the way in which they produce, transport, and sell their goods.

Some Connectivity Already is in Place

A base level of connectivity exists in some parts of the region. This provides a base to build from. In the first phase of implementation *AGora* will seek to connect early adopters.

There is a Global need for Innovation in Agriculture

In expert hands, data is intelligence. Hyper-local data is a valuable resource for planning and decision-making. It enables innovation in food production and security, transportation, and waste management. It supports applications that improve farm productivity and profitability.

Progress is Being Made in Data-Driven Farming

Agriculture focused companies are developing increasingly complex and data hungry systems to support farm/crop and livestock operations. Many are seeking the next generation of improvements based on hyper-local data that enables a site-specific response.

Partners Have Come Forward

We have sought and confirmed interest from potential private sector and academic partners. These partners will enable initiatives across the full research, development, and commercialization spectrum. More work will be done in the first phase of implementation to confirm roles, responsibiliti funding, but a base is already in place. Partners are willing to bring matching money to the

Early Adopters Have Been Identified

Early adopter farmers and businesses have been identified. Eighteen farmers and business from the four counties have agreed in principle to participate. More work will be done in th phase of implementation to select those who are most capable, best located, and most app the initial development projects.

imp stakeholders already on board

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Technology Design

Deployment of *AGora's* digital data trust platform will deliver a data exchange system that enables control and sovereignty of data assets. This will help data producers and consumers reap the rewards and value from these data assets, create a pipeline of next-generation products and services, broaden job opportunities, and accelerate economic prosperity and inclusion, while solving real-world farm management and community problems.

8.3. The Rigor of Our Approach

The stakeholder engagement, strategic design process, and definition of an outcome-focused roadmap for implementation, has been fundamental to our approach. This delivers a plan that can be implemented across organization, system, sector and community boundaries. Through the participation of key stakeholders, the strategic direction for collective action to address the following "wicked problem" has been developed:

> *Deliver decision-making tools, informed by hyper-local data and connectivity solutions, that benefit residents that, in turn, improves Canada's food production and distribution system, enhances rural safety and security, incents young families to become life-long farm operators, and, when fully implemented, increases the prosperity of rural Canada.*

Our proposal defines a common purpose, including contributions from diverse stakeholders, the corporate structure needed to deliver this strategy, a clear path forward based on specific deliverables and outcome, and a method to link costs to the desired outcomes. We undertook three parallel initiatives in this phase of work to confirm existing connectivity in the region and an infrastructure strategy to move forward; further detailing of the family of products, partnerships, and services to be established under *AGora's* innovation mandate; and ongoing public engagement to identify priority needs and public interest in the work to follow.

When brought together this delivered an integrated plan to create the structure, oversight, partnership, and innovation model required to meet the design expectations of the Smart Cities Challenge. We have not taken this lightly, as we understand both the challenges ahead for Canada's rural economies, and the huge impact that connectivity, data, and new tools for decision-making can have on its future.

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9. Our Promise to Canada - What we will create

AGora is singularly focused on creating a rural innovation incubator that will design and deliver the three key elements to achieve the Vision it set for itself in the original Smart Cities Challenge. It will:

1. Define, establish and operationalize a number of Internet of Things based Farm Area Network pilots to take advantage of the interconnected technologies currently available. *AGora* will establish a Data Trust to collect, store, manage and add value to the data collected through these networks. This will enable farmers, and all rural residents, to improve their operations and to monetize data.
2. Research, define and establish a number of key agricultural-focused Innovation Labs to work with the private sector and academia to deliver new products and services to local farmers, producers and residents through the *AGora* Data Provider Network, the *AGora* Farm Area Network and the Geographic Information Systems (GIS), and other technologies, established within *AGora*.
3. Conduct a number of pilot projects to deliver a fundamentally different means to provide ubiquitous, competitively priced broadband service to rural residents. *AGora* will test a new Data Provider Model, working with other providers already servicing rural clients through electricity and natural gas distribution systems.

Accomplishing these initiatives will fulfill the goals we set for ourselves and support a growing and prosperous rural economy.

A bright future for rural Canada

"Newlyweds Steve and Julie and their growing family just moved back home to take over Julie's family farm. Several of AGora's programs are in place, and the future of farming looks bright. AGora's stable of products are capturing highly relevant data from the family farm, integrating it with specialized applications and are improving decision making. Profitability is up - both from improved farm operations and from the collection and use of the farm's data in ways that benefit the family farm.

Steve and Julie also have been able to relocate and expand the media business they built while living in the city. Agora pilots have proved out, and real time, state-of-the-art connectivity is available throughout the region.

These fundamental changes made farming a more attractive lifestyle choice for Steve and Julie. This vision of the future helped them decide that the time was right to buy out Julie's parents and enjoy living in a connected rural Alberta. "

10. Our Promise to Canada – How Value will Flow

We will create value in four streams of action (Value Streams):

1. We will establish and build *AGora*, as outlined in the "Building *AGora*" Value Stream.
2. The "Farm Focused Technology" Value Stream will deliver on-farm communication capabilities.
3. The "SMART Information Management & Technology" Value Stream identifies cross functional requirements to establish and maintain the systems that will underpin *AGora*, including Data Trust and data oversight, as well as architecture design requirements.
4. The final Value Stream – "Connecting People, Technologies and Farms" lays out specifics on how community engagement and understanding will be achieved.

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ENGAGEMENT

Implementing change is difficult, and engaging residents and stakeholders is crucial in obtaining and maintaining their support. This plan describes how *AGora* has engaged communities and businesses to build the proposal and how it will sustain community engagement throughout implementation

1. Community Engagement To-Date

Parkland County held discussions with representatives from the neighboring three counties initially, to inform them of the Smart Cities Challenge, identify requirements, and confirm commitment to create a regional coalition representing nearly 62,000 people.

Farm and business leaders from the four counties were engaged from the start to develop this
se leaders reflected the diverse nature of the region, including farming, ranching,
s, and residential interests. A steering committee was established to oversee the
nity consultation process and provide input to develop our initial application.

ocus groups provided information on the adequacy key priorities, and next steps.
ere invited to contribute ideas used to define the challenge. This engagement included
velopment boards and members of the broader community. In-person interviews were
h local officials and other community members.

nes emerged that were used to articulate our Challenge and define the key outcomes
it will be achieved. All four counties formally endorsed the shared vision.

1.1. Preparing This Implementation Plan

Our commitment to community consultation has remained a key focus in this subsequent phase of work. The engagement process was expanded to inform preparation of this detailed implementation plan. The community steering committee provided continuing oversight.

The Design Team

A Design Team of 20 individuals – including steering committee members, other participants from the region, representatives of the provincial and federal government, and sector experts – participated in developing a comprehensive Strategy Roadmap. The Design Team also helped to answer the following fundamental questions:

- Attributes of *AGora* that will incent farmers to participate
- Key features of the innovation incubator that are most important for rural residents
- Pressing connectivity challenges that need be resolved to help maintain rural competitiveness and connection to the on-line economy
- High-level design of the incubator, including structure, staffing, relationship to sponsoring agencies, and the role of the private sector

The resulting Roadmap identifies the strategic goal, the outcomes necessary to achieve it, required actions, and resulting positive impacts and benefits for the region. The completed Roadmap was presented at a regional open house on February 5, 2019, where community members and civic leaders had the opportunity to review and provide feedback on the results.

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Community Dialogue

A community engagement process was conducted in parallel with the work of the Design Team. Community members from across the four counties were consulted to obtain input on requirements and delivery priorities, and criteria for a future-focused marketing plan to build community understanding of *AGora* during implementation. This dialogue helped identify early adopter farmers and businesses that are prepared and well-suited to be first-to-market with this approach. This included the following activities:

- Communication through a website, social media, and email lists
- One-on-one meetings, phone calls and written correspondence with community stakeholders including primary producers and food makers
- Workshops using Lego Serious play method to gather community aspirations and concerns
- An online survey for agriculture and community stakeholders

Consultation with the Four Counties

Significant consultation took place with other municipalities that exist within the four counties. This recognized the intrinsic linkages between these communities and their adjacent rural constituents. Many producers and people with rural businesses live in these communities and work on the farm. *AGora* services and technologies will have to link to these communities.

Stony Plain, Spruce Grove, Drayton Valley, Hinton and Edson were briefed on the project and invited to support the initiative. Each has done so. This consultation ensured full commitment of the region to participate in achieving success.

First Nation Discussions

The proponents engaged Enoch Cree First Nation and Paul First Nation as future collaborative partners and have received letters of support from both Nations' Chiefs. *AGora* has several agriculture areas that will support goals of partnering with the Nations in areas such as food security, education, technology and connectivity and job creation.

2. Insights Gained That Have Shaped Our Final Proposal

Community outreach efforts involved focus groups, an online survey, on line postings and one-on-one meetings. Over 800 unique visits were made to our website to become informed on the project. 140 links were provided to the survey to gather input – 77 responses were received. Over two dozen meetings were held with individuals to discuss the final proposal that informed its final design. Outreach has been extensive and significant.

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Insights from Community Consultation

An on-line survey was developed to invite participation and input. Respondents described success as (1) ensuring consumers, particularly Albertans, are aware that food produced by Alberta farmers is safe; (2) ensuring financial sustainability of farms; and (3) adopting technology to advance business.

Reasons for Participating

When participants were asked "What would you most like to achieve by participating in the activities of the Agriculture Innovation Living Lab?" the most important reasons for participating were to share input to help develop solutions, gain early access to innovations, and lever these innovations to strengthen their business. The least important reason for participating was to get reduced pricing for being an early adopter.

It appears that contributing and receiving information that will advance their business outweighs the cost associated with accessing that information. This will be important for the sales strategy and marketing material of *AGora* products in the future. The adjoining quotes provide context and are drawn from survey responses.

Connectors and Champions

Participants in the online survey were asked to list where they access expertise to improve their operations. They could choose from people pre-populated by others in the survey or they could list additional people.

Analysis of these relationships identified groups and key stakeholders in the social network. We asked participants to identify who they have collaborated with and who they want to collaborate with, to indicate cohesion; and who they think are experts and where they get innovative ideas from, and to indicate influence.

"Albertans are aware of how safe, responsible, available, and wonderful our home-grown ag products are. Further, Albertans with an interest in agriculture are able to connect directly to our producers, enabling communication, collaboration, and innovation."

"The consuming public accepts that the products we produce are safe and produced sustainably, not only environmental but also economic."

"Have our companies grown from start-up to the next level of their business growth and have the middle ones grown to their next level? Have they introduced new innovations in product development, technology and food safety? Have they gained access to market?"

"Less silos, more working together."

"I track all my expenses, making constant alterations to my plans. I am an entrepreneur I will never truly feel successful and do not want to, because if I did then I would stop driving ideas."

Nine groupings of people were identified who are connected to each other through people they feel are experts. Many of the respondents who answered this question listed one person or a few that they go to for expertise. These individuals in the community are already seen as experts and could be utilized as Community Champions in future work.

There is an opportunity for *AGora* to provide partnership connector services and broker collaborations that may not otherwise happen. A first step for quick wins will be to identify triads in the network map that can be closed. By closing an open triad, a closure with four points of connection is created, fostering network-building and innovation.

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3. Community Representation in *AGora*

Community input was fundamental to helping define ongoing community participation.

AGora Board of Directors and Committees

The Board of Directors will be drawn from the Design Team that delivered the strategic plan, municipal representatives and private sector, academic and other levels of government. It will include farm, business and municipal representatives, and others from the region. The role and structure of the Board is described in the GOVERNANCE chapter. Core members have already been recruited.

Partners from the Four Counties

The public engagement process confirmed the roles of existing service providers (agriculture service boards, local non-profits, three levels of government), and academic leaders. Core participants have been recruited. The nucleus for delivery across the four counties is in place. Further work will confirm levels of participation, define clear needs to be met through *AGora* delivery and establish any legal frameworks required to support system deployment.

Early Adopters

Farm and business leaders from the four counties have been engaged from the beginning. Early adopters have been identified from this group to lead implementation. A core group of early adopters will help deliver pilots to improve rural connectivity and be a test-bed for agricultural innovation.

Early adopters will help to identify new ways of connecting rural areas, collecting hyper-local data, and developing tools for on-farm decision making. They will provide access to their farm operations, and support for technology developers using the *AGora* platform. The "Connecting Peoples" Working Group is fully described in the GOVERNANCE chapter of the proposal.

4. Engagement with Community Stakeholders

Ongoing community engagement will enable the proponent to make sound decisions about the future of *AGora*; educate community members about the challenge; inspire confidence in local decision-making; maximize awareness and support for the project once it is launched; and facilitate wise and enlightened project development. One primary on-going activity of *AGora* will be to create opportunities for stakeholders to become better informed.

The "Connecting Peoples" Working Group described in the GOVERNANCE chapter will provide accountability and leadership to *AGora's* Board on stakeholder engagement, and will identify innovative and evidence-based strategies, techniques, or tools that could be used to sustain stakeholder engagement. The Stakeholder Engagement Plan that will be delivered will ensure two-way communications between *AGora* and stakeholders remains effective, relevant, and efficient.

AGora staff will be responsible for implementing the engagement tactics and activities, and for undertaking regular and on-going monitoring.

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Engagement Activities

The implementation phase (Phase 1) will be important and intense, underpinned by significant consultation. We will not only educate community stakeholders about the project, we will develop excitement about the future of *AGora* and its goal of increasing prosperity in rural Canada. We will work directly with the community. Initial engagement will finalize the vision for *AGora*, expressed as a brand and brand promise, confirming the guiding principles for the *AGora* platform, and establishing partnerships to carry the initiative forward. We will involve the public and key stakeholders in:

- Sharing collective aspirations
- Gathering stakeholder input
- Ranking project opportunities
- Ongoing education and information sharing

Engagement will achieve the following outcomes:

- Stakeholders are satisfied with every interaction they have with *AGora*
- The Board of Directors is proactive in seeking information from stakeholders, and is well informed on stakeholder needs and wants
- There is consistency in how stakeholder engagement is conducted and how information is used and reported back
- Stakeholders are recognized for their contributions, and have a real and tangible influence in the direction of *AGora*
- Organizational succession planning is informed and intuitive with a pool of engaged stakeholders

Engagement Tools and Approaches

A variety of engagement tools will be used by *AGora*, including a dedicated website, social media, blogs, electronic newsletters, and traditional media.

The website will be intuitive and responsive, designed and written in plain language so it is easy to understand. It will be accessible in alternative formats and will enable feedback through online questionnaires. The site will link to reports, newsletters, event information, community contributed content, and project communication. An email sign-up function will collect user emails for future engagement and information sharing.

Social media accounts will be created on platforms like Twitter, Facebook and Instagram. These profiles will be regularly maintained, will be engaging, and will have analytics tracking. The goal will be to create an online community of users that can be converted to *AGora* customers using calls to action. Primary producers will be engaged on Twitter using hashtags like #agchat and #cdnpoli.

Use of traditional media will include radio, TV, and newspapers – with columns in newspapers and the *Western Producer*, and spots on the agriculture radio show *Call of the Land*.

AGora will establish extensive connections to people in the region. A community leader database and network mapping tool will help staff planning engagement initiatives to build relationships, invite input from, and engage with people to ensure diverse representation and ongoing inclusion. Team members will engage with stakeholders on an ongoing basis by phone, email, mail and at in-person meetings.

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Monitoring and Reporting Results

Stakeholder engagement is only useful when it meets its objectives. Engagement activities, feedback, and the success of engagement efforts will be monitored against the objectives described above. Monitoring will be based on:

- Tracking engagement points, including who attends consultation events, contributes to content creation, identifies an early adopter, participates in prototype projects, visits the website, provides comments, and participates in surveys
- Asking participants to provide feedback on how they feel about being involved in *AGora's* design
- Using in-person and online surveys to determine which engagement activities are useful, fun, informative, and effective for participants
- Internal evaluation of engagement activities by staff and consulting teams, reflecting on the engagement activities at strategic checkpoints in a project: Did we meet our engagement objectives? What did we do well? What could have been better? What will we do differently next time?

Regular reporting of activities, successes, failures, and opportunities will be reported to the community to ensure *AGora* remains relevant and that new stakeholders have ways of knowing and engaging. Once *AGora* is operational, the benefits it enables will be seen by others, attracting wider participation. As other farmers and businesses join, a larger regional test-bed will be created. Deployment to new users will extend regional connectivity and enrich the hyper-local database. Expansion of the infrastructure and information base will be coordinated thorough *AGora*, attracting new private sector participants to its innovation platform.

5. Recruitment and Involvement of *AGora* Partners

A variety of partnerships will be established in *AGora*. The GOVERNANCE chapter describes the roles and contributions of each type. The Communications and Engagement Plan commissioned through this initiative (Kumpula Design, 2019) provides a plan of action for recruiting and training these partners.

Technology partners will be central to *AGora's* success. *AGora* will provide the infrastructure required to develop and deliver products designed to meet specific needs of the farm and business community. Each solution will be created in partnership with one or more private or academic partners. Letters of interest are included in an appendix to the proposal.

We have been successful in obtaining commitments from a large number of municipal, government, academic and technology providers through formal **Letters of Support**.

While relationships have not been concluded, they have all expressed their excitement about this proposal and the chance to work with us to realize its compelling vision.

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Summary of Letters of Support and Expressions of Interest Received			
Mayor of Parkland County	Leteta Farms	Town of Edson	Connect Mobility
Service Alberta, Asst Deputy Minister	Brian Olafson	Town of Stony Plain	AB Centre for Sustainable Rural Communities
Minister of AB Agriculture and Forestry	Telus Communications	Village of Wabamun	Parkland Ag Services Board
Minister of AB Economic Development	University of Alberta - Faculty of Science	GROWTH, Regional Economic Dev.	Edmonton Metropolitan Region Board
Chief Morin, Enoch Cree Nation	Yellowhead County	Acheson Business Association	3C Information Systems Inc.
Chief Rain, Paul First Nation	Brazeau County	ATS Traffic	Cybera Inc.
Sightline Innovation Inc.	Lac Ste. Anne County	Stony Plain MLA	EQUS REA Ltd.
John Knapp	Parkland GIS	ISP Computers	ATCO Gas
Alberta Machine Intelligence Institute	West Central Forage Association	Brandon University, Rural Dev Institute	IBM Research & Development Centre
TECTERRA	Parkland Ag Services	Crop Pro Consulting	Ventus Development
ESRI Canada	City of Spruce Grove	FortisAlberta	Dell
Northern Alberta Institute of Technology	Spruce Grove Chamber of Commerce	Comtech Communications	Utility Network & Partners Inc.
Bell Mobility	Town of Hinton	Zayo Canada Inc.	Integral Strategy Network Inc.
ATB Financial	Town of Drayton Valley	Frank Robinson	

Most significantly, *AGora* has secured support from Sightline Innovation Inc., a Canadian IA solution and Data Trust provider. Sightline's support includes participation as a technology provider and manager of the data trust infrastructure. Sightline's suite of technologies and R&D activities will provide state-of-the-art data protection, data management, curation, and machine learning products to inform farm decision making, processing, and market entry. Equally important, its technologies will provide a means by which data collected from farm and business operations would be monetized and deliver value. Refer to the DATA AND PRIVACY and TECHNOLOGY chapters and the CONFIDENTIAL annex for full details.

6. Engagement Within Projects

Community involvement is designed into *AGora's* delivery process. *AGora* will establish and lever participation of local experts, partners and stakeholders. The following structure supports implementation of the four Value Streams, as described in the PROJECT MANAGEMENT chapter.

A core staff of *AGora* employees will provide the foundation for the implementation engine. They will take leadership roles to move *AGora's* Value Streams forward and work directly with community participants through defined Working Groups. These Working Groups will include local stakeholders, partner representatives, subject matter experts, and volunteers, and will help understand, focus, and identify near-term objectives and priority outcomes. See GOVERNANCE chapter for full details.

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One responsibility of the Working Groups will be to define work plans that will be reviewed, prioritized, and funded by the *AGora* Board. Once approved, teams will be established to implement the solutions. The Working Groups will oversee the progress of the projects they have submitted.

The intention is to encourage participation on project delivery and wide attendance at community events where *AGora* initiatives are discussed. The Community Engagement Value Stream will ensure people in the community are informed, can propose or champion initiatives, and contribute to any of the Value Streams based on their skills and interests. This will lever the collective intelligence of the community, build internal initiatives through the partner and vendor network, and ensure initiatives are grounded in community needs. External initiatives brought forth by the community, that deliver value and achieve outcomes, will be a testament to a successful change program.

7. First Nations Engagement

In forming this final application, the proponents engaged Enoch Cree First Nation and Paul First Nation as future partners and have received letters of support from both Nations' Chiefs. *AGora* has several agriculture areas that will support goals of partnering with all Nations in the region in areas such as food security, education, technology and connectivity and job creation.

AGora will be committed to meaningful indigenous engagement. It will seek to establish a strong relationship and build trust between the project and indigenous stakeholders, based on:

- Developing a wholistic understanding of the communities, by conducting or compiling research including the history of the community, environmental concerns, fishing, hunting, and gathering activities, spiritual practices, governance, tribal council affiliations, decision making structure, role of leaders and elders, identification of elders, community priorities, socio-economic situation, relationship with counties, and relationship with any previous project proponents.
- Respecting the ongoing impacts of colonialism, the history the community has with the land around them, and cultural differences.

Upon award of the Smart Cities Challenge prize, we will extend our engagement to all Indigenous communities in our region and the urban Indigenous community in neighbouring towns and cities.

8. Diversity, Equity and Inclusion

Significant effort has been made be inclusive and consider the diversity of residents, including identifying how specific groups can be involved in delivery. Ensuring equity requires understanding who is currently being engaged and developing strategies to engage other populations. Review and analysis of participation in engagement activities is critical. Historically, affluent white males tend to be the main participants in traditional engagement activities. Being aware of this and employing strategies such as those listed herein will ensure equity in stakeholder participation.

AGora will use human-centred design concepts such as place-based engagement, where the engagement team goes to stakeholders rather than expecting stakeholders to come to them. It is known that this type of engagement increases diversity and allows for engagement of different population groups that wouldn't traditionally participate in community engagement activities. Another

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example is the use of prototypes and community design review workshops where stakeholders are asked to provide feedback. This will engage a broader population.

AGora will conduct community based participatory research on its own or in partnership with post-secondary institutions. This will engage with those most affected by a challenge or issue to support research and analysis and identify strategies to address the challenge.

Engaging Youth

Engaging youth in municipal activities is typically challenging and has seen limited success. Youth engagement initiatives proposed for *AGora* include:

- Working with 4H groups, local secondary and post-secondary schools and using existing makerspaces and hackathons to engage with students to create and collaborate on projects.
- Pairing students with partner companies in technology, media, or agri-food, as mentors, or sponsors of internships or work placements.
- Involving youth in video production to be used in *AGora* or for future consultation events.

Community Outreach Activities

To obtain community input from people who don't typically get involved in these types of consultations, we also will pursue other outreach activities:

- Engaging in conversations where project team members visit coffee shops where farmers and community members gather, randomly buying people coffee and sitting down to engage in a brief 5- to 10-minute conversation about *AGora*. This technique will be used at strategically selected times through implementation.
- Using network mapping to identify people in the community who have strengths and expertise to share, and others who are looking to improve their capacity in a particular area. By identifying and engaging these groups, *AGora* will help to establish peer networks that bring new ideas and engagement from people and organizations that may not typically engage with each other. This also will assist in obtaining input from the 'silent majority.'

In summary, it is critical to understand problems and opportunities by working directly with the affected population or stakeholder groups to develop options rather than working on solutions for them in isolation. Otherwise, it is difficult to fully understand the challenges these groups face and define the opportunities to overcome them. *AGora* will evaluate options based on the feedback received from diverse populations and will ensure consideration is given to how the plan will benefit other population groups, particularly the most vulnerable.

Workforce Training

Through the *"Connecting Peoples"* Working Group *AGora* will develop a training plan for users, operational staff, partners, and customers. This training will use the most appropriate and advanced technology for delivery. There are some excellent training firms in the region.

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9. Risks and Mitigations

AGora's proposed corporate structure inherently manages risk – duties, structure, planning processes, policies, regulations and overall accountability processes both assign responsibility and contain risk. The GOVERNANCE chapter fully articulates roles relative to how public engagement will be managed, deployed and delivered.

Managing Community Expectations

Risk - Unrealistic expectations of residents that all ideas and suggestions will be implemented.

Mitigations - Communicate levels of ambition when planning and initiating stakeholder engagement. Ensure the process is fully explained and that stakeholders are clear about the decisions and approaches being taken. Inform and involve key community members in implementation.

Lack of Follow Through

Risk - The community does not see follow through related to outcomes of the engagement process and lose faith in the process or the project.

Mitigations - Ensure actions, even if small, are implemented in a timely manner after engagement with stakeholders. Before engaging, ensure that appropriate resources are allocated and that implementation plans are achievable. Communicate with stakeholders when decisions are made on what will be implemented.

Lack of Representation and Inclusiveness

Risk - Some people or groups may lack the time, confidence, mobility, language skills, or ability to contribute equitably. Vocal and organized groups may be more active, which leads to unrepresentative participation.

Mitigations - Determine the level of representation and input that is practical and achievable given the resources and timeframe. Use existing networks, and community champions to encourage participation. Use appropriate engagement methods at the right time and in the right place. Ensure engagement events are accessible and that they are culturally appropriate for a range of participants. Tailor engagement activities for different stakeholder groups.

Over-Engagement

Risk – Over-engagement is non-productive. This may lead to consultation fatigue and cause community members to become antagonistic or cynical.

Mitigations – Where relevant, use the results of previous engagement processes that have worked. Ensure engagement activities are meaningful and create clear outcomes. Focus engagement activities on stakeholder groups whose ideas, needs, and concerns are less understood than those whose perspective is already well known.

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Negative Input

Risk - Community members may be overly negative toward the project due to other frustrations with the municipality, based on previous or current engagements.

Mitigations - Focus on future-forward conversations. Listen to stakeholders and acknowledge past experiences. Use engagement methods that are appropriate for the desired outcome. For example, avoid an open house when there is already known anger or extreme controversy.

Lack of Interest in Participating

Risk - Many municipalities have challenges getting participation and have become reluctant to spend resources on engagement processes.

Mitigations - Spend adequate time identifying stakeholders and ways of involving them that is appropriate for the desired outcome. Ask stakeholders how they would like to be engaged. Ensure activities are fun, social, and held at a time of day and location that is convenient. Identify Hubs in the community where people naturally gather and engage with them there. Be clear about the levels of ambition, ensure stakeholders know the influence they can have. Ensure feedback is provided to people about how their input is reflected in a project.

Managing Unintended Impacts

Risk – A project has unforeseen adverse consequences.

Mitigations - Clarify the challenge to ensure engagement efforts result in more sustainable solutions and avoid adding to the problem. Involve various population groups prior to developing solutions to understand the impact on each population group and identify the solution with the least negative impacts on stakeholders. Ensure transparency of communications so, when unintended impacts occur, stakeholders are informed and can participate in managing the outcome. Build and promote relationships with stakeholders to establish trust and reduce uncertainty among population groups. Ensure stakeholders including staff have access to resources and knowledge for project management and stakeholder relationship management.

Dealing with Unanticipated and Emergent Issues

Risk – Stakeholders react negatively to unanticipated and emergent issues.

Mitigations - Manage stakeholder expectations to assist in dealing with and overcoming issues. Build meaningful dialogue with stakeholders about the issues of interest in the project. Communicate with stakeholders early and often and create the opportunity for stakeholder engagement when issues arise to ensure community participation in solutions. Regularly monitor the stakeholder group against the project maturity, realizing that the group may change depending on project activities.

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TECHNOLOGY

Connected technologies and data sovereignty are the core of this Smart Cities proposal. The following sections outline key technologies that will be put in place to deliver hyper-local data collection needed to derive value from connected technologies, deliver the enabling pilots necessary to better link farms to the world, and enable software to be created to support focused decision making. Creation of the necessary technologies to collect, manage and monetize farm data – a new crop – delivers new revenues in support of increased rural prosperity. Deployment of rural-focused software 'labs' supports rural innovation and delivers superior decision-making tools to all.

1. A Catalyst for Innovation

The diagram on the following page broadly describes how access to hyper-local data will be enabled across the four-counties; how it will be managed, curated and monetized; and how the various elements will be delivered.

AGora will provide value to data providers, AGora itself, academia, and the private sector through a series of Innovation Labs dedicated to data analytics, software design and infrastructure development.

The Labs will pilot new communications technologies and will incent participation by partners to create new products and services and conduct focused research that supports rural and agricultural development.

2. The Technology Environment

To enable digital innovation, *AGora* will design and deploy technology that includes internet connectivity and farm area networks, underpinned by *AGora* technology and Data Trust platforms.

Internet Connectivity

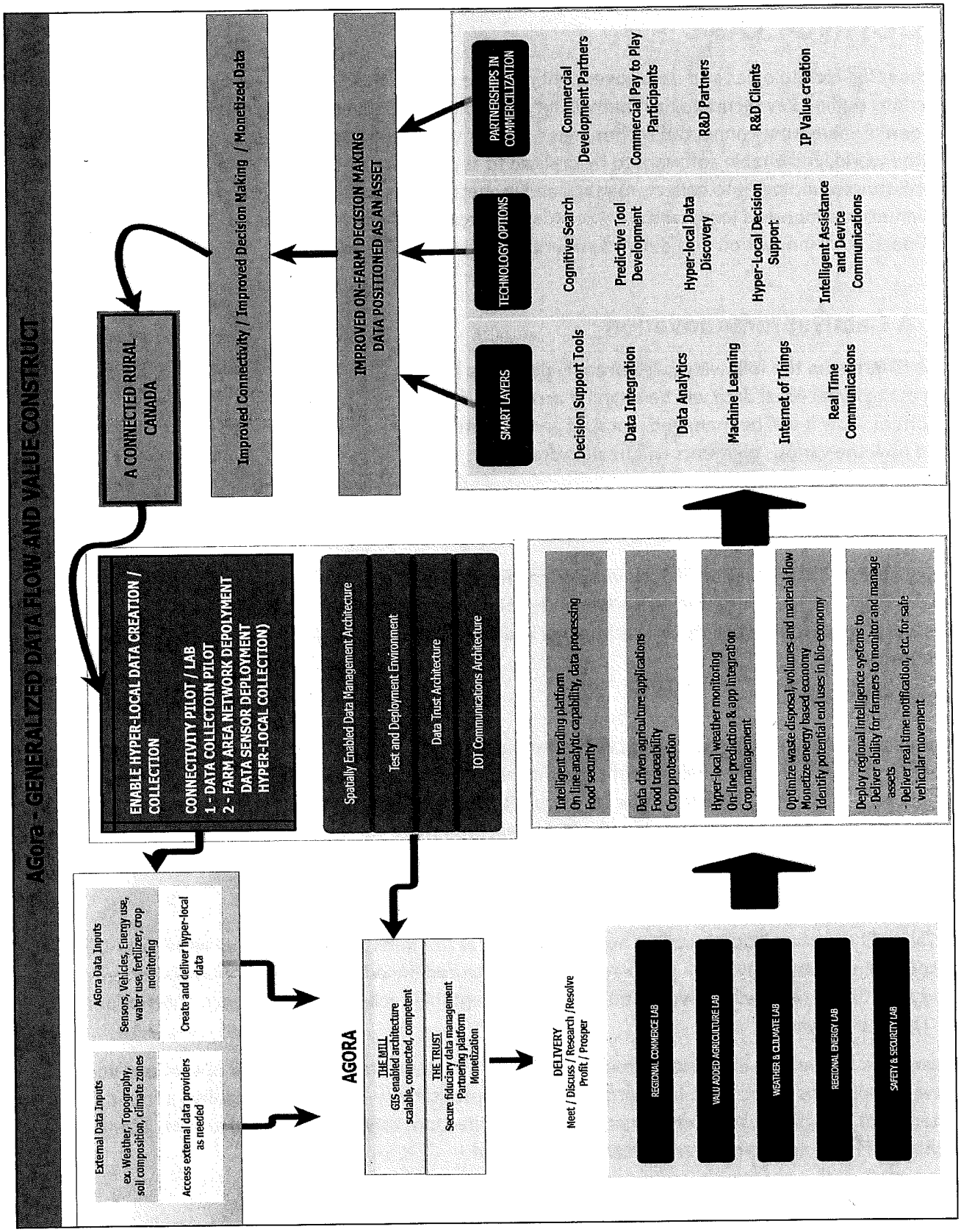
Connectivity and capacity are significant communication barriers in the region due to the large geography and relatively small size of the rural market. This is a fundamental challenge that has predicated most of the activity in the four counties and much of this proposal. Traditional service providers have been reluctant to invest. *AGora* will undertake competitive pilots with non-traditional service providers to test and evaluate new connectivity solutions.

Farm Area Networks (FANs)

AGora will test the ability to collect hyper-local data at the farm level. Farm Area Networks will disperse connectivity over 10- to 20-acre plots, configured based on each farm's layout, orientation and structure. *AGora* will deliver pilots to define acceptable technical performance criteria for Internet of Things deployment.

Farm Area Networks will support agricultural sensors deployed to monitor farm operations and develop solutions to increase farm productivity and profitability. *AGora* will establish a foundational Internet of Things infrastructure for baseline data collection; this will be expanded with additional sensors, as new applications are tested and deployed.

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AGora Technology Platform

The *AGora* technology platform can be thought of as web-based services focused on data management – GIS enabled and connected to a suite of data analytics – that can be extended to host an application portfolio. The intention is that the model be completely cloud-based. It will be designed using a "software as a service" model to ensure scalability and transferability.

AGora will provide a minimum latency testing and development environment for partners and vendors to use for prototyping and development, generating an *AGora* revenue stream.

The farmer and vendor portals will be integrated with the data view and application portfolio. *AGora* will prove, develop and support this capability. Internet of Things deployment will deliver rivers of data for each farm, providing additional value to *AGora* partners, supported by appropriate technologies.

Data Trust Platform

AGora will work with partners who use data to create value. To ensure that the rights and privacy of data providers are protected, and those providers benefit from the use of their data, *AGora* will implement a Data Trust. Trust in the traditional sense of the word is a three-party relationship where an asset/value is transferred from a Grantor to a Beneficiary through a Trustee. A Data Trust takes this concept further and establishes a technology framework that enables control and sovereignty of data assets between data partners.

"Phil has completed another harvest, and now its time to plan for next year. All of the data collected from his farm for the past year (and before) have been collected into AGora, incorporated into its GIS and the Data Trust, and analyzed. He has at his fingertips information that links national and international corporate decision tools with his own. This software now is intelligent enough to tell him site specific information that he will use to make decisions about next year's crops.

Thanks to AGora's information services, he has access to the best available forecasting tools regarding future's prices and anticipated yields of the various crops that fit his site-specific characteristics best. He's looking forward to another profitable season."

3. The Technology Working Group

Further work will be required to assess and confirm the products, services, and pilot projects required to bring life to *AGora*. A select number will be necessary to establish operations, connectivity, and initial client value. They are defined in this proposal, along with the associated costs. As described in the GOVERNANCE chapter, one role of the Technology Working Group will be to conduct this assessment and confirm a delivery plan. Led by the Chief Technology Officer, teams will implement the framework, below, and champion the principles through the life cycle of the work ahead.

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4. Core Technology Architecture

The overall design will apply open technologies, standards, and policy based on an agnostic architecture. It will allow freedom for innovation and maximization of value. This architecture will rely on a framework that emphasizes:

- Understanding of and alignment with a Business Vision across the various services to be provided.
- Logical modelling, that pays attention to well-bound component models, and open, standardized component interoperability. This will address fundamental requirements and concerns like information and device security; and messaging, protocol, pattern, and content standards.
- Devotion to scalability, extensibility, interoperability, replicability, portability, and reusability. Strongly influenced by concerns for accessibility.
- Anytime, anywhere, any-device access.
- Application of established Best Practices, and definition of new Best Practices for use by other communities in their Smart City initiatives.
- Use of generalized models and standards related to the Internet of Things, assimilating and applying new ideas and standards as technology is developed.
- Continual monitoring of technology trends and vendor capabilities. The market for Smart City transformations will be large, leading to prosperity for both adopters and providers. Marketplace competition will drive increased value.
- Use of pilot projects to mitigate risk, maximize value, and establish Building Blocks, with an emphasis on re-use. The more re-use, the less that needs to be done, maintained, and operated (a smaller footprint).
- Use of cloud services as 'quick-to-market' platforms for delivering early value.
- Attention always to the cost of ownership, avoiding vendor monopolies.
- An evolutionary approach that avoids the big bang and provides benefits early and often.

5. Open Technologies

AGora will have a strong preference for open and open-source technologies. There are two general classes of services: (1) more traditional services like back-end analytics, collaboration, and resource pooling; and (2) innovative applications and data sharing. In the first case, technology is more mature and there is greater freedom of choice for standardizaton. In the second, there are fewer options; we don't want to limit innovators, but will require compliance with important things like the security framework, messaging standards, etc.

These demands drive creation of core partnerships with companies where security, standards and data integritywill be maintained and balanced with demands for cohesion across business, application, information, and technology domains. As described in this chapter, Sightline Innovation Inc delivers the only built-in Canada solution that enables data sovereignty without eroding control resulting from data owners being forced to move to a cloud provider or being subjected to vendor lock-in tactics.

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Non-Proprietary

Services will be provided in a way that is open and non-proprietary. Logical boundaries will be established which facilitate the participation of partners with proprietary technologies. For example, Data Providers will be able to gather data in the manner they like, but security, transport, message construct, and delivery to Data Consumers will be standardized and based on Open concepts.

Multi-Vendor

A logical component model will drive provisioning of technologies through granular, well-defined requirements. The overall technology architecture will allow for multiple vendors to participate while *AGora* supports integrated and interoperable solutions. Vendors will seek to promote their own end-to-end offerings. These offerings will be evaluated in light of their implications for vendor lock, cost of ownership, and constraints on agility and extensibility.

6. Technology Standards and Policy

AGora's technology architecture will ensure business alignment. A Technology Standards and Policy Framework will be put in place that maps business services to application components, that are in turn mapped to technology platforms, standardized or optional technology, and policy. *AGora's* intent is to produce portable, replicable solutions that significantly reduce deployment cost to other locations.

International Standards Organization (ISO) and other certifications will be sought, as required, as confirmation of diligent engineering, and to enhance attractiveness to other communities.

Interoperability & Open Standards

Interoperability will be architected based on open standards defined through best practices. The industry has come a long way in the last 20 years. Patterns of interoperability will be selected that support other core objectives such as scalability and availability. Today, the preference is for asynchronous messaging that can behave like synchronous messaging, and is expected to mitigate a variety of issues related to unexpected downtime by participating systems. It also allows for incremental 'forwarding or streaming' of data from source to analytical stores, rather than dependence on potentially long batch cycles.

Replicability

Replicability will not be limited to reusable, portable solutions, but will include business processes and governance frameworks. *AGora* will architect so third-party innovation and intellectual property are uncoupled. This will allow for 'plug and play' of alternative solutions. We will protect third party Intellectual Property, and will endeavor to arrange for re-use by other consumers at reduced cost.

Our proposed open, standardized technology will be designed with scalability, replicability, and extensibility in mind. Open and standardized technologies, by themselves will ease the challenges of portability. Portability will be further enhanced through well-bound, uncoupled, cohesive solutions, so discrete 'portions' of the solution can be packaged and ported as sub-system modules or, at a minimum, re-usable frameworks. This also allows *AGora* to port easily to other hosting partners should we be dissatisfied with the service.

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Scalability

Scalability will be tested in pilot projects or proven through prior application. Almost all scalability issues can be addressed by adopting patterns that have been proven to be scalable. If there are issues, they will be identified early, and appropriate expertise can be brought to bear. Scalability issues are typically a function of flawed architecture/design in a technology, information or application domain. Resources are readily available in the marketplace to deal with these issues.

7. Accessibility and Usability

Accessibility and usability of technologies and applications are planned to go beyond 'anytime, anywhere, any device' access. To the greatest extent possible *AGora* will design and implement tools and systems that are usable by all people. This will be enabled through negotiation of development agreements with private sector firms to ensure overall usability. This will expand the population of contributing participants and increase the value they receive. This includes designing for visual (blindness, color blindness), physical, and capability (oral, language) considerations. These requirements will be elaborated and ranked early, and throughout the initiatives so they can be addressed through the requirements, design, develop, and test iterations.

8. Future-Proofing

IT Architects have learned hard lessons from years of being trapped into forced, costly upgrades of proprietary technology. *AGora* will take all due care and diligence in making technology choices, and contracts with technology partners will be designed to provide appropriate protections.

Architects will research current and future trends. The growing Smart Cities community will increase the availability of resources. Initiatives by *AGora* itself should influence the local market. Partnerships with educational institutions, and employment of young graduates is one way to effectively future-proof the solutions. By embracing simplicity, isolating complexity, and committing to well-bound logical modelling, an adaptable and continually evolving solution can be implemented.

The Data Trust is designed to grow and accommodate the impending wave of massive Internet of Things (IoT) technologies and new data sources. It also is designed to meet the needs of future regulations around the governance of data. As data production becomes more ubiquitous, we anticipant governments in the coming years to update existing laws or enact new legislation around the use, governance, and sovereignty of data.

9. Compliance with Legislative and Regulatory Requirements

Compliance with Legislative and Regulatory Requirements will be articulated and designed into every part of the solution-building framework.

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10. Platform Technologies & Collaborators

Core capabilities within *AGora* will be supported by two underlying technologies. First is a fully secured data management solution – the *AGora* Data Trust. Second is a fully integrated Geographic Information System (GIS). *AGora* will deliver secure data management of IoT initiatives through its platform. Discussion is provided, below, with further details on how proposed technologies will protect and secure data in the DATA and PRIVACY chapter.

Through the development of this proposal significant effort has been invested in building corporate and academic interest in the work ahead. The following section outlines the enabling technologies that *AGora* will develop over its initial five years of operation. Those with appropriate technologies or having expressed interest in the technology opportunity are linked and identified, below.

10.1 The *AGora* Data Trust

The *AGora* Data Trust will collect, move, share and profit from the data that is provided to it. AGora's Data Trustee role will be legally defined and will clearly state the fiduciary responsibilities held by AGora and the respective parties. The Data Trust will be delivered through proprietary technology that is tested and deployed to protect, curate and monetize data on behalf of data providers. The structure for *AGora's* operations relative to equity, safety and security of operation will be established through the incorporation process. *AGora* also will confirm its fiduciary responsibilities:

- Accepting its responsibility to manage and provide honest-broker secure access to data on behalf of the farmers, businesses and others that maintain and provide data to it.
- Obliging its operations to provide long-term benefits to providers of the data.
- Confirming the technology framework to grant sovereignty over the data provided, grant control over the assets held in trust and establish pre-conditions for participation – a contract with each data provider and data user.

AGora assets will include data, curated datasets, analytic models, intellectual property, and machine learning technologies developed onsite. A Data Use Policy Framework will be developed to guide data use. *AGora* will work with data and technology providers to establish policies for this purpose.

The proponents have held significant discussions with technology solution providers to find potential partners with the same view of data, data ownership and monetization, in advance of committing to a specific vendor. Given that *AGora* is not yet a legal entity, no specific agreement has been established to provide the required architecture and

> *"Phil and Arne just left the last meeting of AGora's Technology Working Group. To say they were pleased is an understatement – they were ecstatic! While there, AGora transferred into their bank accounts the first payment from the Data Trust. As early adopters, they helped AGora set up the Trust, describe what data is most valuable to them, and what needs to be done to collect it and then use it to add value to their farm operations. They then helped design the system to collect all the hyper-local data going into the Trust.*
>
> *It was a long process, but now it is paying off handsomely. Companies are paying to access the data. And, as importantly, AGora is delivering to Phil and Arne huge amounts of information to help with on farm decisions. Decisions are becoming easier, and the time saved is being channelled into family, community and other farm activities."*

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technology solution. However, Sightline Innovation Inc., a leading Canadian technology provider, has provided a technology framework in anticipation of working with us to define their future participation in full deployment. Core elements of the solution are:

- Sightline's technology enables people, organizations, companies, and governments to control their data, derive value from data, and gain better insight from existing data sources in real-time across multiple business units and organizations. Its comprehensive Data Trust Platform is the only built-in Canada solution that enables data sovereignty without the erosion of control resulting from data owners being forced to move to a cloud provider or being subjected to vendor lock-in tactics.
- The company provides its services through two proprietary and patented Software as a Service (SaaS) based platforms: Sightline Innovation Data Trust ("SID") and Sightline Innovation Machine Learning for Optimal Networks ("SIMON").
    - SID is as a trusted alternative to centralized data lakes for Trust members to share data and perform advanced analytics at scale. The platform provides the ability to keep data in place, share data securely in a virtual data-exchange facility, and uses AI and distributed ledger technologies for network governance, membership onboarding, project evaluation and performance monitoring.
    - SIMON is Sightline's AI and machine learning platform. It provides AI capabilities through the integration of three distinct components: AI Domain, AI App, and AI Edge. SID and SIMON are currently delivering computational value in the Canadian agriculture, health, defense/biosecurity, and manufacturing sectors.

Refer to this proposal's CONFIDENTIAL Appendix for details on the Sightline family of technologies

10.2 Geographic Information Management

Data will be the critical focus and content of every product and service supported by *AGora*, which will be underpinned by a geographically-enabled data platform. A cloud-based scalable Geographic Information System will manage and access the growing array of geographically-referenced data. It will house diverse data related to the Region. Through this platform *AGora* will collect, curate and distribute data on behalf of participants and organizations looking to develop and commercialize new agricultural applications. ESRI Canada has offered their family of GIS technologies. Future discussion will fully define their roles.

11. Communications Technologies

The Regional Connectivity Lab will pilot and deliver the infrastructure required to collect hyper-local data and connectivity across the region on par with today's urban experience. This connectivity will be instrumental to enrich *AGora's* data assets and operationalize the innovations that *AGora* will develop with private sector partners. The Lab will be deployed as part of the early formation of *AGora*.

The Lab will accelerate expansion, improvement and utilization of wired and wireless connectivity throughout the region. Work will be based on a comprehensive geospatial map of all tele-communication infrastructure in the Region, including optical fibre, copper wireline networks, and terrestrial and satellite wireless networks. Maps will use data acquired from local governments, senior

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governments, network operators and other external sources, and from field mapping projects to fill gaps in coverage. Geospatial co-ordinates are an essential dimension to all fact-based analytics.

The regional telecom infrastructure map will be used to devise strategies, solutions and plans for expanding and improving digital connectivity throughout the region. This will require cooperation between property owners, local governments, senior governments, telecom network operators and other partners including energy providers and Internet service providers. *AGora* will undertake and support development projects to expand and improve digital connectivity in the Region, starting with two pilot projects.

11.1 Pilot 1: Internet Connectivity via an Energy or Gas Provider

Most farms and residences in rural Alberta are connected to an electric network and a gas network. Most of this rural infrastructure was developed through collaboration with property owners, governments and the service provider.

This pilot will test the viability of using these providers to deliver rural fibre connectivity comparable to urban Canada – across this rural landscape.

AGora will undertake a Data Provider Network (DPN) Pilot Project that supports the Farm Area Networks (FANs - detail following) with optical fibre connections managed as an open service. As with established rural energy networks, building rural data functionality will require collaboration between property owners, governments and operators. Electric utilities that incorporate data provision into their infrastructure can use it to mitigate growing risks posed by accelerating adoption of distributed power generation and storage systems by customers.

This pilot will include the following:

- Partnering with one or more electric and/or gas providers interested in incorporating optical fibre data provision into their existing infrastructure and operations: **four have expressed written interest**
- Collaborating with providers, governments and engineering and regulatory consultants to identify and eliminate technical and regulatory obstacles
- Collaborating with providers to choose footprints for one or more pilots
- Engaging, educating and organizing rural property owners within pilot footprints, and guiding them in developing connectivity co-ops to accelerate utilization and drive return on investment
- Collaborating with connectivity co-ops, service providers, providers and governments to develop sustainable and scalable models for financing, operating and using data infrastructure
- Managing the pilot for a period of 3-4 years, and developing a succession plan if needed
- Attracting multiple service providers interested in leasing capacity on the infrastructure developed to deliver digital services to rural communities, including competing service providers
- Defining, measuring and reporting on meaningful performance metrics

Expertise developed during deployment will be captured in a series of Best Practice Case Studies for future development by both *AGora* and others as Canada-wide scale-up takes place.

Technology providers have indicated interest and confirmed support. Most significant, four energy utilities will provide time and effort in support of proofs-of-concept through the Regional Connectivity Lab pilot projects. FortisAberta, EQUS REA Ltd., ATCO Gas and Zayo Group have all confirmed their interest in participating in pilot initiatives to assess how their existing infrastructure can be used to

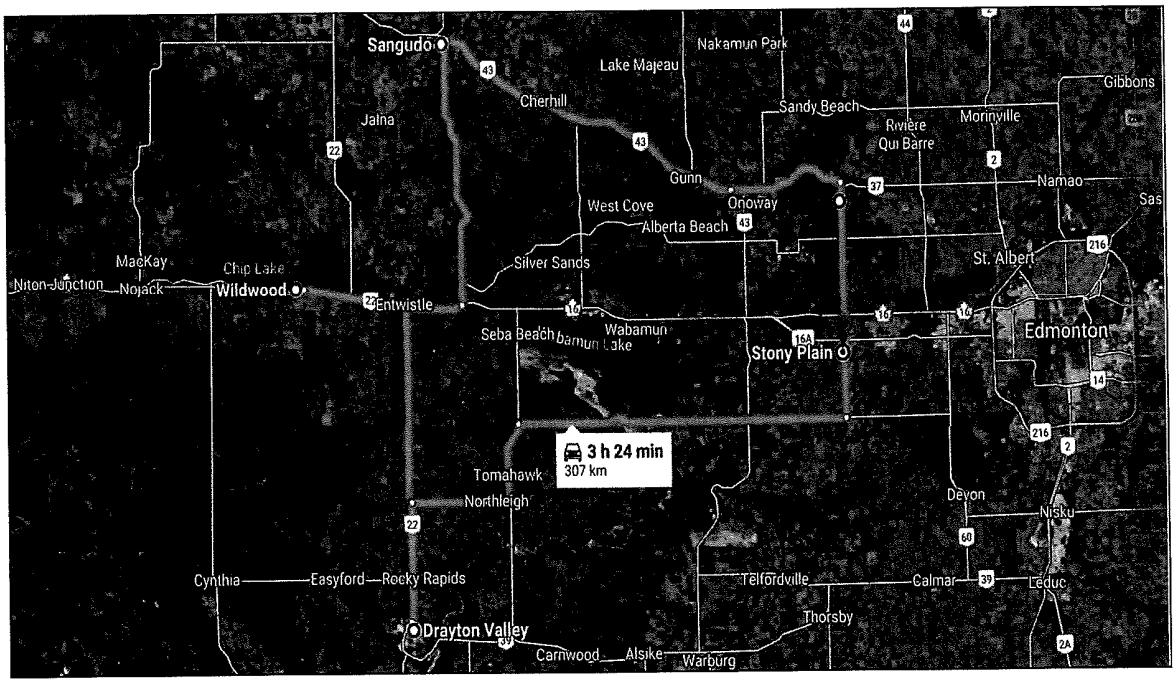
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support broad deployment of rural communications technologies. **This is considered a fundamental achievement**. The ability to collect and move information cost-effectively in a rural region is essential. *AGora* will determine how this will be achieved through the participation of these companies.

11.2 Pilot 2: Establishing Farm Area Networks (FANs)

AGora will undertake a Farm Area Network (FAN) Pilot Project to demonstrate the value of cheap, ubiquitous and unlimited on-farm connectivity for agricultural operators. The FAN Pilot will connect a diverse array of remote digital sensors and other devices to on-farm wireline and wireless networks, enabling remote monitoring of the environment and operating conditions, and remote operation and management of fixed and mobile equipment.

For efficiency of fibre optic access, the FAN Pilots will deploy close to County offices. *AGora* will use the FANs to collect data and deliver experiential understanding of digital on-farm innovation and hyper-local data collection



Each FAN will enable wireline connectivity within a farmstead, as well as wireless connectivity by way of a mesh network that serves a footprint at least one kilometre in diameter. Existing poles and buildings will be used where suitable to mount access points for the wireless mesh networks, but additional poles or towers may be required to provide connectivity into fields. The pilot will include:

- Building partnerships with technology and service vendors interested in leveraging the FAN
- Piloting to showcase their solutions, including network solution providers
- Selecting suitable early adopter farm operators to serve as venues for the pilot
- Designing the financing, technical, operating and business models for the pilot
- Coordinating and managing development of the FAN networks
- Procuring, installing, monitoring and maintaining the initial constellations of devices connected to each FAN, and adding to these constellations as needs and resources allow

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- Managing the pilot for a period of 3-4 years and developing a succession plan
- Engaging communities and local innovation leaders in experiential 'show me' learning relating digital innovation in agriculture and rural life
- Defining, measuring and reporting on meaningful performance metrics for the pilot, including impacts on rural innovation activity and leadership.

Optical fibre connectivity for all FANs will be essential to the effectiveness of the pilot. The proponents believe the performance of optical fibre connections can be vastly improved at marginal incremental cost, enabling the FANs to support the broadest range of digital innovations far into the future.

Today, fibre-connected homes and businesses in Olds, Alberta can buy Gigabit-per-second (Gbps) Internet service for $125 CAD/month. Fibre-connected homes and businesses in some U.S. markets can get 10 Gbps service for only $200 to $300 USD/month.

Bringing the same performance and pricing to homes and businesses throughout rural Alberta requires a fundamentally different paradigm for rural connectivity. The current paradigm forces service providers to build their own physical networks to deliver their services, but related costs are an insurmountable barrier to market entry for most would-be competitors. This is especially debilitating in low-density rural areas where competitive connectivity is needed most, but markets are too weak to support effective competition.

"Joseph's Farm Area Network is being expanded. Initially, a collection network was built to gather hyper-local data on farm operations at his immediate farm site. All machines, fixed assets, inventories and 'precision-farming' equipment were connected. Sensors were deployed to collect vehicular movement, moisture condition, and planting (variety, nutrient, chemical) and practices, etc.

Now, he is expanding the system to collect data from two new sources – full lifecycle tracking of his cattle herd, and to a newly purchased section of cropland 20 miles west. His current FAN has paid for itself, and has cost justified expansion to other parts of the business. An additional benefit he enjoys, thanks to AGora's Regional Security System is the comfort, and reduced insurance premiums, of knowing his valuable equipment is protected while he and his family sleep and even go on vacation."

Collaborators, Expressions of Interest and Technology Alignment

Bell Mobility	Telus Communications	Cybera Inc.
FortisAlberta	ATCO Gas	EQUS REA
Zayo Canada	3C Information Solutions	Utility Net
O-Net	Connect Mobility	Comtech Communications
First Nations Technical Services Advisory Group	IBM Research & Development	ISP Computers

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12. Application Labs

AGora will establish a secure testing and development platform that provides internet enabled tools to enable residents to meet, discuss, research, resolve and ultimately prosper from the data access provided by the interactions generated and the data that will underpin *AGora*. This is where private sector partners, and perhaps even competitors, can work together to co-develop new innovations to benefit the farmer and other rural residents. These 'Labs' will be enabled in several ways. First is active definition of requirements with a specific vendor, in partnership, that delivers the requisite capabilities. Second is by making available the data housed at *AGora* to interested parties that, in turn, develop specific applications. Content, challenge and opportunity definition will confirm which approach is most viable given the 'Lab' in question.

12.1 Regional Commerce Lab

With a website in place, one of the first capabilities that will be established is an on-line tool for commerce. Developed and managed in partnership with a commercial vendor, the Regional Commerce Lab will deliver a marketplace/trading system that allows farmers to advertise their products and services within the region and beyond. Initial plans include land for rent or sale, new and used products for sale, and specialty items. This system also could be a vehicle for community associations, clubs, blogs, Do-It-Yourself groups, and a video library. This will enable many other community cross-connections.

"Jane poured herself a coffee and sat down to log into AGora to check if any of the chickens she had posted yesterday had sold. So far 6! She transfers her funds into her account and messages to make delivery arrangements. Not a bad start to a Saturday. She noticed she had a message on one of the message boards. It was a recent graduate for Olds College wondering if she still had the summer job available that she had posted a week ago? Maybe one more cup of coffee and watch a quick video – the one the research teams had sent her about new feed for her poultry."

The Regional Commerce Lab will be a vehicle to support 'buy local' initiatives. This will allow people in urban areas to source and purchase locally grown and made products and communicate directly with the producer. Using data provided by both buyers and sellers, it will enable research and analysis of regional markets and identify future growth opportunities.

Several products will support regional food security initiatives. The World Food Summit of 1996 defined food security as existing "when all people at all times have access to sufficient, safe, nutritious food to maintain a healthy and active life." *AGora* will provide the ability to encourage and facilitate food security for rural, urban and indigenous communities. The issue of food security will be addressed, and solutions discovered, through the partnership between community and technology.

This is a priority deliverable given the maturity of on-line market solutions, and the many partners that exist in the marketplace. Several have indicated a willingness to work with *AGora* to move forward.

Collaborators, Expressions of Interest and Technology Alignment

Expression of Interest / Technology Alignment	
Sightline Innovations	NAIT Industry Solutions
CropPro Consulting	Alberta Machine Intelligence Institute
University of Alberta	ATB Financial

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12.2 Regional Value-Added Agriculture Lab

The Regional Ag and Food Lab will map, monitor and analyze agricultural production in the region. It will improve understanding of food production and food safety by rural and urban residents alike through delivery of data-driven agriculture that uses hyper-local data. Blockchain technology will secure and enable data collection and the analytics required to support ever-increasing demands for food traceability, much like how *Gem* is working in the USA with the Centre for Disease Control to put epidemics on blockchain to increase effectiveness of source identification and disaster response. Applications will prove provenance, inform production decisions and identify gaps in the supply and security chain of farm products as they move to market.

> *"The video Jane is watching is about the new process that will track her poultry from hatching to freezer using the new block chain technology. It will help take away consumer questions when she can track all that went into the birds and download it onto an FAQ sheet to go with delivery. When the video is over, she logs into the member area and sees how the other participants in the poultry study are doing. She makes a note that one other participant's birds are maturing much quicker than hers and enters her own weekly data."*

Key enabling features that have been identified by farmer participants process include mapping and monitoring agriculture and food operations and markets throughout the region, having the ability to conduct research, and analyze regional potential for agriculture and food production (gap and opportunity analysis). *AGora* will build regional capacity for data-driven agriculture and help deliver traceability of primary and value-added products, improving food safety overall.

Significant future partners have indicated a willingness to work with *AGora* in co-development. Farmers themselves are being required to provide ever more detailed information on point-of-origin food provenance and contact traceability as animals move through the feedlot system (point of contact detailing for disease tracking etc.). Canada is expecting and demanding greater proof of food safety to support expanded domestic and export markets.

Collaborators, Expressions of Interest and Technology Alignment

Expression of Interest / Technology Alignment		
Sightline Innovations	ATB Financial	University of Alberta
NAIT Industry Solutions	Alberta Agriculture	Crop Pro Consulting
Alberta Machine Intelligence Institute	Alberta AG and Food Council	Telus Communications

12.3 Regional Weather and Climate Lab

This Lab will link the collection of micro area weather information to land use, intelligent farm practices and crop selection and management. It will improve decision making on crops planted, nutrients required to optimize yields, inform management decisions (like when to spray/harvest, etc.) and better plan for daily farm activities. LoRa Sensors are already being deployed around the world for Agriculture purposes and would be assessed for use in the regional pilot.

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Real time weather data will be collected at the farm level and linked to regional and national databases. Mapping and monitoring of weather systems will take place and be linked to on-farm support tools. A real time, micro-area weather service will be enabled.

Creation of a large data set that links farm-based decisions to climatic activities, predicting on a much more localized and specific basis short term weather events, and informing better farm decisions will result. *AGora* believes this linking of micro area weather data with existing data sets managed by existing research and commercial endeavors will provide value along the full value chain, as providers of national and regional farm data are interested in delivering greater farm management services and risk reduction to the end user. The end user, in turn will be enabled to benefit from the delivery, analysis and use of their information.

These data also are expected to help model and assess projected regional impacts of climate change and support development of regional strategies to adapt and mitigate the impacts of pending change. As such, *AGora* anticipates involvement by academic, research institutes and government institutions involved in climate response, building regional capacity for understanding, adapting to, and capitalizing on climate change.

"Harvest is in full swing, and it's time for John to head home for the night. His daughter meets him and takes over the combine, which she will run all night – not a problem since the software on the combine has linked the combine's GPS guidance system to satellite data and the hyper-local background moisture data the farm has collected. It tells her where the wet spots in the field are, and what weather may be coming, and ultimately how late she can combine. The system also has linked data from the family's land 20 miles west with information from the quarter she is harvesting, and told her what she needs to know – a specific forecast - to keep on harvesting."

Collaborators, Expressions of Interest and Technology Alignment

Expression of Interest / Technology Alignment		
Sightline Innovations	ATB Financial	University of Alberta
NAIT Industry Solutions	Bell Mobility	Crop Pro Consulting
Alberta Machine Intelligence Institute	SensorUp	3C Information Solutions

12.4 Regional Energy Lab

Evolving out of a question around proper disposition of regional waste will be the delivery of a Regional Energy Lab. Participants confirmed interest in delivering a system that integrates the region's waste management and recycling services into an efficient use of agricultural and residential by-products. Rapid improvements in energy production technologies and economics are steadily creating more profitable opportunities for consumers of fossil fuel energy to become more self-sufficient producers of their own clean energy, including energy from renewable sources such as sunlight, wind and industrial waste. These opportunities are driving an accelerating transition of energy economies from household to global scales, amplified by social and political responses to climate change.

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Ag operators and rural communities can exploit these opportunities to improve self-sufficiency and profitability while reducing their dependency on grid power and fossil fuel, reducing their GHG emissions in the process. Solutions for energy are increasingly plentiful, accessible and affordable. The Energy Lab will work to accelerate energy transition throughout the Parkland region, helping regional innovators identify and exploit opportunities to profit from advances in energy technology.

The work of the Energy Lab will include:

- Mapping and analyzing the regional energy economy, including sources, quantities and qualities of industrial waste that can be gasified or incinerated to drive electrical power generation.
- Helping regional innovators build comprehension and competency around energy economics and solutions for community and on-farm energy production and management, by providing online tools for energy-related learning, analysis, modelling and planning; online and onsite learning tours and learning workshops relating to energy solutions and energy transition; and demonstration projects

"Dave just finished putting in a bio-fuel plant on his farm to serve his needs and the neighbouring farmers who invested in the business. By using AGora he identified all the local supplies of lower grade canola and other crops and 'carbon based' materials that could feed a facility like this, identified the most effective technology and confirmed local markets for the bio-fuel.

They found, through AGora, a local entrepreneur with the bio-fuel technology they needed to make their plant successful. Dave now can claim a federal carbon credit, as Canada's Clean Fuel standard provides a financial benefit to 'green energy' producers."

Collaborators, Expressions of Interest and Technology Alignment

Expression of Interest / Technology Alignment		
Sightline Innovations	ATB Financial	University of Alberta
NAIT Industry Solutions	Alberta Machine Intelligence Institute	

12.5 Regional Safety and Security Lab

Mapping, monitoring and mitigating risks to people, livestock and property throughout the region is a growing need. Today urban residents benefit from real time security monitoring and delivery of safety services. This has been enabled through advances in communications technologies not yet in place in rural regions. This Lab will work towards deploying a full network of IT enabled sensors, monitoring systems and integrated products that deliver real time ability to track, maintain and monitor on farm and rural assets.

The Lab also will improve safe vehicle movement across the counties, particularly with respect to large vehicle (farm, municipals and industrial) and significantly reduce the number of collisions between personal vehicles and large industrial vehicles which often move at slower speed and take up much more space on the road.

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It is recognized that several enabling actions are required to deliver upon this Lab – broad connectivity must be established to provide the base to monitor farm and rural assets; blanket coverage and data collection ability along major traffic routes needs to be enabled; and linkage to information systems deployed in vehicles must be enabled. Initial implementation will take place through data collection to be enabled through each FAN.

First order work is engagement with research and development institutions involved in issue definition and delivering proof of technology. They exist. The Applied Research Centre - Sensors & System Integration at NAIT, the Centre for Smart Transportation at UofA and Alberta Traffic Safety (corporate) have expressed interest in participating in the design and delivery of this Lab, and the use and development of the data that support the decision-making infrastructure. Significant work is envisaged to fully define the technical requirements, enabling software and partnerships to bring life to this Lab.

"Before heading home for the night John switched on the guidance systems for the grain carts that have been filled during the day. The autonomous vehicles begin their slow drive home, and should be at the granaries by morning. He is not worried since they are fully integrated with necessary road telemetry and traffic information. Crossing several grid roads and a major highway used to be a problem, but now that the county is fully networked and vehicles can receive real-time notification of big machines on the road, it's a safe and efficient process to get the crop home in off peak hours when it's safest."

Collaborators, Expressions of Interest and Technology Alignment

Expression of Interest / Technology Alignment		
Sightline Innovations	Bell Mobility	SecurTek
NAIT Industry Solutions	Alberta Machine Intelligence Institute	University of Alberta
University of Alberta – Smart Transportation	Alberta Traffic Safety	

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13. Technologies Supporting Global Research Initiatives

The platform established through AGora will enable the collection and analytics of huge amounts of highly specific information related to rural and farm activities. Thee data will support significant research and development, be it through academia or the private sector.

Collecting hyper-local data in a rural farm context, with leadership from farmers willing to be involved delivers a new approach to research and vette technologies. Data will be created that fully informs how farms are being managed and operated. In addition, in between the lab and full commercial deployment there is the opportunity to deploy real-world trials, collect huge sums of data to inform design decisions, and see how new technologies actually are being used – by the farmers themselves.

"Today is the day that the crop development companies deliver their new seed varieties. Several early adopter farmers are ready to plant highly tailored varieties to see which perform best under "real-farm" conditions. Global research has matched soil type and climatic zone, predicted moisture needs and defined specific nutrient/micro-nutrient requirements in test conditions. Now it's time for farmers with the means to collect huge quantities of information to put these varieties to practical tests. The full sensor networks across the farms will collect data that will inform decisions on genetic improvement, crop support (nutrient, herbicide / pesticide) use and which perform best under what condition, to name a few.

Development companies that are recognized AGora partners benefit handsomely from access to these real-farm conditions and are willing financial partners / contributors to the farms' operations. Huge decisions now rest on the outcomes, as companies can determine which variety works best where, and which hold promise for long term improvement. Thanks to AGora's Data Trust, these companies also have access to the data needed to commercialize their new variety's in other parts of Canada, and the world, with similar characteristics.

14. Risks and Mitigations

AGora's proposed corporate structure inherently manages risk – duties, structure, planning processes, policies, regulations and overall accountability processes both assign responsibility and contain risk. The GOVERNANCE chapter fully articulates roles relative to how projects will be managed, deployed and delivered.

Privacy and cybersecurity breaches will be treated as a primary branch, especially as they relate to devices, network, and data ownership. We intend to partner with experts to address this concern.

Human Safety Related to Autonomous vehicles, and downstream utilization of robotics

Risk – 'Renegade' behavior rooted in the unavailability of sensor and/or component interoperability.

Mitigations – Exhaustive testing related to any, and all, scenarios regarding the dependency of autonomous vehicle 'losing contact' with governing related objects; example connectivity, vehicle/sensor mechanical failure. Continuous operational monitoring of network and exceptions.

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Local device shutdown should be programmed on certain conditions; remote shut down should be available and applied. Apply other best practice remedies.

Risk – 'Renegade' behavior rooted in malevolent 'hack', or intrusion, related to vehicle or device.

Mitigations – Multi-factor authentication can be applied to 'control' devices (see Sightline). Detection of attempts to intrude should be logged, examined. 'White hat' hackers can be employed for testing/ongoing. Local device shutdown should be programmed on certain conditions; remote shut off should be available, and applied, on suspicion of takeover.

Reliance on signaling/alerting technologies that are less than 100% available

Risk – Signaling and alerting technologies become mainstream and will gain mainstream adoption. Citizens expect and are guided by their information. They may be sometimes unavailable.

Mitigations – Wherever possible apply a similar solution pattern that is applied to traffic lights. In the example of traffic lights, the red lights blink for all drivers; indicating outage and defining behavior (four way stop). In the example of notification of 'heavy machinery ahead', notify 'may be heavy machinery ahead', until systems are fully operable.

Privacy of Information – Impersonation and Identity Theft related to authentication/access

Mitigations – As described in the TECHNOLOGY chapter, we intend to partner with sector experts to address this fundamental rick. Best practice mechanisms will be implemented based on monitoring, and the detection of suspicious behavior, and emphasis on 'safety first'. 'White hat' hackers can be employed for testing/ongoing. We will define processes to mitigate security breaches that will identify the root cause, those harmed, level of harm, and 'resolution of root cause' actions.

Privacy of Information – Other

Mitigations – The data governance and data management model positions Data Providers to define what data will be available, to what consumers. Best practice mechanisms will be implemented based on monitoring, confirmation that solution is working as defined (no leaks), the detection of suspicious behavior, and emphasis on 'safety first'. 'White hat' hackers can be employed for testing/ongoing. Define process for Security Breach that identifies root cause, those harmed, level of harm, and 'resolution of root cause' actions.

Technology Project Execution – Quality/Time/Budget

Mitigations – Adherence to the architectural principles, and the following checklist are typical mitigation strategies:

- Employ Proof of Concept (PoC) and Building Block concepts.
- Define expertise required and provision the necessary people/partners.
- Define how expertise will work together and optimize the engineering process.
- Define small teams and make them accountable for outcomes within the overall architecture.
- Engage as many full-time, for a period, resources as possible as momentum reinforces persistence.

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GOVERNANCE

Different levels of involvement by different groups will unfold. Teams, partners, stakeholders and early adopters will help define success. This chapter describes how the project(s) will be governed. At the core is a new not-for-profit company with the responsibility to link those involved in the most effective way possible, provide operational transparency and align diverse interests in common purpose.

1. A Not-for-Profit Organization

AGora will be created as a not-for-profit corporation to establish clear lines of responsibility, provide operational transparency, incent diverse interests to participate for the common good, and mandate clear financial accountability. Materials supporting incorporation of *AGora* (bylaws, etc.) and the operational design of the organization will clarify its purpose and direction for staff, partners and funding entities alike.

> *AGora* will be created as a new not-for-profit corporation. This model has been chosen with deliberate care.

AGora's Strategy Roadmap defines initial outcomes to be achieved to create an effective GOVERNANCE structure. The key outcome is that its design supports national transferability, effective governance, monitoring and sustainability. The mandate of *AGora*, subject to Board input, is to:

> ***Take advantage of the 'virtual' nature of the internet and its connected technologies to support thriving rural communities.***

The not-for-profit structure delivers a practical framework to:

- Ensure equal representation by the four sponsoring counties: It was deemed impractical to house delivery inside any one of the four municipal structures.
- Establish means to attract corporate participation and financial support: This will create the ability to engage in legally binding development initiatives with private sector interests.
- Incent academic involvement: This will deliver a 'living lab' across significant geographies. *AGora* establishes more than a 'test plot' approach to support research and validate innovation – tested in real time – under highly variable conditions and deliver highly detailed data to support academic processes.
- Frame accountability in ways that are well-understood: The straightforward legal structure will be well-understood by external third-parties, with respect to both delivery and accountability (external audit).
- Provide a means to hire, service debt (if any), set contracts/agreements and receive revenues: This will be a legally enacted entity.

The Objects and Bylaws of *AGora* will reflect this and other key design criteria. *AGora's* legal structure will create a risk management and mitigation framework that provides responsible oversight to fund delivery and assign clear operational accountability.

To prepare this proposal a best-practice review of similar organizations was undertaken. A number of not-for-profit organizations provided materials. The applicants received significant support from TECTERRA (Calgary), a technology innovation support centre that has developed bylaws and operational guidelines that meet and exceed federal/provincial standards. The design of TECTERRA, founded in 2010, has helped to ensure long-term support from both the federal and provincial government. This has informed the proposed *AGora* model.

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2. *AGora* Board and Advisory Groups

Board Structure and Membership

It is envisaged that the *AGora* Board will be comprised of members representing each sponsoring county, local farm and rural interests, select for-profit firms, First Nations, communications providers, economic development interests, academia, and federal and provincial government representatives as deemed appropriate. A 13-member board is considered optimal.

The following members of the Design Team that created the Roadmap guiding full implementation have agreed to sit, initially in an advisory role to oversee establishment of the corporate entity, which they will then join as board members:

- John Knapp (retired) - Deputy Minister, Alberta Ministry of Agriculture
- Peter Laffin, Director of Business Development, NAIT Applied Research Centre - Sensors & System Integration, Office of Research and Innovation
- Sarah Leteta - Bison Rancher, Entrepreneur
- Brian Olafson (retired) - Vice-Chair Board of Directors, TECTERRA; Board Member, Cybera; Vice-President, Bell Canada

AGora bylaws will define membership structure in detail.

Board Committees & Working Groups

Initially, the following leadership groups will be created:

- The Finance and Audit Committee, responsible for providing support and advice to the Chief Financial Officer (CFO), monitoring and reviewing the financial performance and internal controls, developing the annual budget, and acting as a point of contact between the Board and the external auditor.

- The Technology Working Group, responsible for providing support and advice to the Chief Technology Officer (CTO) and *AGora* in the development of supporting infrastructure and applied technology initiatives that will deliver immediate benefit from new ICT capabilities for the agricultural sector.

  Major technology projects will require additional analysis prior to confirming investment. Drawing on best practices from similar not-for-profit organizations, the working group will be mandated to provide a rigorous review of development initiatives that includes monitoring and evaluating the strategic direction for programs and activities, selecting applied technology initiatives, placing emphasis on those that will create immediate benefits for the rural economy and assessing and recommending projects for approval by the Board, within the funding guidelines and budget constraints for these projects.

  The overriding consideration for approval of projects is: Does the proposed development have the potential to enhance the economic and social well-being of rural Albertans and Canadians through the improved use of connected technologies?

  The Technology Working Group will include members external to *AGora*. It will be comprised of well-respected, volunteer representatives from industry and the research community who have a background in issues related to *AGora's* mandate.

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- A Connecting Peoples Working Group made up of early adopter participants that will focus on priority requirements of the initial group of farms and businesses. They will provide accountability and leadership on stakeholder engagement, and will identify innovative strategies, techniques, or tools that are evidence-based that could be used to sustain stakeholder engagement. This will confirm their interests, provide practical guidance on design of *AGora*, and help to define infrastructure and data requirements from a user perspective.

3. Management and Staff

The Executive Team

The Chief Executive Officer (CEO), reporting to the Board of Directors, will be responsible for translating strategic Board intent into corporate action. The CFO will deliver financial oversight, manage day-to-day financial operations, develop and oversee budgets and deliver audited statements following selection of an external accounting firm.

The CTO will be responsible for defining *AGora's* overall technology strategy and deploying and applying corporate technology assets in the rural / agricultural sector and beyond. Responsibilities also include design of the technology platform to manage *AGora* data, liaison with the Technology Working Group to recommend technology solutions for *AGora* and its partners, and oversight of system operations across the four-county region.

AGora Staff

AGora will be staffed to the minimum level required to ensure success. Full requirements will be defined in the implementation phase. Job descriptions will be created, and positions will be filled.

Staff will take leadership roles in moving four Value Streams forward. Each Value Stream will be supported by a Working Group made up of local stakeholders, partner representatives, subject matter experts and volunteers. The CEO, CFO and Office Manager will be focused on the "Building *AGora*" Value Stream. They will carry the vision and change program forward and report to the Board. They will be accountable for overall governance and operation of the organization.

A full-time CTO and a Solution Architect will focus on the "SMART Information Management and Technology" Value Stream. This will include design and implementation of *AGora's* architecture. They will enable the infrastructure through a series of Proofs of Concept and Pilots and focus on the flow of hyper-local data in response to agricultural challenges. They will work with the Technology Working Group to lever the capabilities and expertise of partners and subject matter experts, ensuring that scalability, privacy and security are primary concerns.

Agricultural Technologists will be responsible for providing front-line support to farmers, transferring technology, and a applying a deep understanding of agricultural challenges in each of the LABs. They will work with the Technology Working Group, hand-in-hand with farmers to gather requirements and a deep understanding of the challenges they face, in parallel with vendors and partners applying innovative technology, testing hypotheses, and measuring results. They will combine technological expertise with a hands-on farm work ethic.

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A Communications Specialist will apply their skills to marketing, communication and community engagement, focusing on the "Connecting People Technology and Farms" Value Stream and working with the "Connecting Peoples" Working Group. All staff will be supported by the Office Manager and a part-time Grant Writer who will identify opportunities for *AGora* growth and funding. This person also will work with partners to define required funding and funding sources for more innovation projects.

The intent is to create a 'virtual' organization as much as possible, but modest space will be established for administration and technical support. More may be secured as needed for meetings and for incubator space to support specific innovation projects.

4. Partnerships

Greater value is created in partnership than in isolation. *AGora* is committed to creating partnerships, and will seek to create close working relationships with local producers, the private sector, academia, First Nations, and other groups that share a common interest. The Service Provider Policy Framework will be developed to achieve the outcomes identified in the Strategy Roadmap.

Specific contracts will be established that define deliverables, costs, timelines, control points and oversight, to ensure timely, cost-effective delivery and ensure that the expected value is received. Among other things, this will include project objectives and deliverables, expected impacts, required funding, leveraged contributions, technical approach, plan and milestones, intellectual property ownership, and data ownership.

Infrastructure Partners

Infrastructure partners will include technology, connectivity and internet service providers. Letters of support are included. Infrastructure development partnerships will differ from service development partnerships given the very different revenue potentials associated with success, and the expected challenges in project design and delivery.

Service Development Partners

AGora will provide the enabling infrastructure required to develop and deliver a family of products designed to meet specific needs of the farm and business community. Each solution will be created in partnership with one or more private or academic partners. Partnership structures, revenue models, and risk sharing will be specific to each solution.

Early Adopters

Several groups of farmer and business partners are envisaged. As described previously, early adopters will agree to deploy new technologies across their land base or business. Partnership agreements will define responsibilities and benefits received (such as access to consolidated data and decision-making tools that improve farm practices), revenue potentials, site access, and the like.

Others

AGora will seek to form partnerships with the federal, provincial, and municipal levels of government, First Nations, and others. Financial support from these entities will create new partnerships based on a sharing of risks and rewards linked to success of *AGora*.

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5. Operating Principles

Financial Management Principles

AGora financial oversight will be delivered through combined accountabilities of the Chief Financial Officer, the Board of Directors, and the Finance and Audit Committee of the Board. An independent audit firm will be engaged to report on business operations.

Program Management Principles

Program Governance guides delivery of the transformation based on decentralized and distributed decision-making, clear roles and responsibilities, and coordinated systemic planning, problem-solving and learning at the program level. Collective intention will be sustained by *AGora's* organization and the Board. *AGora* will:

- Create high-functioning teams that are self-managed and empowered to make decisions. Employees will be identified with the relevant skills and experience; gaps will be filled where necessary; team commitments will be clearly articulated; and events, information and tools will support teamwork. *AGora* will focus teams on delivering results.
- Develop a high-level plan for strategic initiatives in a release planning process based on ranked outcomes. This blueprint, created by team members, will indicate the order in which initiatives will be addressed and when they will be completed. It also will serve as the baseline for measuring progress.
- Establish frameworks to track team achievement, assess risk, monitor outcomes and remove barriers to achieving results. As described elsewhere in the proposal, performance measures will be identified and aligned with the Strategy Roadmap.
- Sustain dialogue to resolve conflicting perspectives and ensure alignment. Working Groups, teams and stakeholders will create artefacts and events that support ongoing dialogue around the desired future, enabling outcomes, value delivery, actions, and work. This process will be continually monitored and refined, and the dialogue will respond to changing circumstances.
- Use a Lean/Agile structure to underpin the program budgeting process and plan for future work. Approvals will be linked to funding, priorities, expected results, and decision responsibilities. Program management will focus on balancing work-in-progress, team flow, alignment, dependencies, performance, and progress in achieving program goals.

Project Management Principles - the Lean/Agile Approach

Delivery will be enabled using the Lean/Agile implementation framework. Lean/Agile is widely adopted across the technology sector - requirements and solutions evolve through the collaborative effort of self-organizing and cross-functional teams and their customer/end user. In *AGora's* case, implementation teams will emerge from those who have been engaged to develop the Strategic Plan. Additional members, products, timelines structure and processes will develop from this core. Full articulation of the processes can be found in the PROJECT MANAGEMENT chapter.

AGora will coordinate execution based on active Lean/Agile stewardship of the Working Groups and teams, in cycles of acting, learning, and planning. Project management will be organized around the flow of value. Delivery will be achieved through the Agile teams, where all teams have a synchronized set of events, have an Outcome Owner and a Team Coordinator (see section following), and deliver work linked to a roster and a schedule. As the methodology describes, a regular process will be

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established for program monitoring, communication, and progress that creates a rhythm for sustained performance. Through the Lean/Agile process *AGora* will:

- Create a culture of trust. Teams will be empowered to make decisions. Information will be shared openly and constructively, and team commitments will be honored.
- Be purposeful in value delivery. Innovating and learning as outcomes are achieved, and as impacts are created. Teams will become increasingly competent in working with complexity.
- Strive for agile delivery based on self-organizing, self-managing and cross-functional teams. Deliver value through prioritized outcomes and user stories. Teams will be synchronized through iterations and team events. Progress will be demonstrated at defined intervals and planning will happen just-in-time.

Risk Management Principles

Risk is exposure to a potentially negative outcome, with an associated level of uncertainty. Risk management seeks to identify the risk in detail, explore ways to address it and have the best approach prepared for possible use. Regardless work area, programs face several common categories of risk:

- Business risk related to a shift in business realities resulting from new market challenges or moves made by competitors.
- Technical risk resulting from evolving technology platforms, adoption of new technologies, and the combination of technologies in new ways.
- Operational risk related to suitability of the solution within the existing organizational ecosystem and the skills and knowledge required for the organization to run and support the solution.
- Process risk that occurs when a technique is used beyond its range of applicability or outside of the organization's comfort zone.
- Organizational risk resulting from changes in reporting structure, dysfunctional politics, competing visions, the social dynamics of transformational change, and other forces.

Performance Measurement Principles

AGora will use the Performance Measurement and Improvement System (PMIS) framework for lean-agile programs to measure, learn and achieve continuous improvement. The framework will be constructed based on the capabilities and outcomes in the Strategy Roadmap that describe the strategy and intention of the program. Appropriate metrics have been chosen that will assess progress that is being made to achieve critical outcomes, and to provide the feedback required for teams to learn and adjust. This is described in detail in the PERFORMANCE MEASUREMENT chapter.

Intellectual Property Management Principles

New intellectual property (IP) will be developed. It will be desirable to protect and commercialize this intellectual property. The Chief Technology Officer will be responsible for defining ownership and how value is realized from its development, either independently or through delivery partnerships.

AGora's Intellectual Property Policy framework will allow for timely, efficient dissemination of new IP, while allowing for its commercialization. *AGora* policy will recognize the respective interests of all funding participants in creating this intellectual property. Benefits are expected to accrue to the creators, *AGora* and other sponsors of the activities that reflect their respective contributions.

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Data Privacy

By design, *AGora* will collect and manage data, and will be responsible and accountable for the data under its control. The Chief Technology Officer shall be assigned Privacy Officer responsibilities to ensure compliance. Technology compliance is fully detailed in the Sightline technology architecture; please refer to details provided in the TECHNOLOGY chapter and the CONFIDENTIAL appendix.

6. Letters of Support

We have received fifty-five Letters of Support from a substantial number of key constituents for this project. This demonstrated commitment to work with us has been received from all municipalities in the region (4 partners and 5 additional towns and cities); technology producers; connectivity companies; First Nations; government ministries; agricultural producers; technology accelerators; academic institutions; utility companies; and key volunteers (some of whom have agreed to serve on an inaugural Board as AGora is established). The complete set of letters received is provided as an appendix to this proposal.

7. Risks and Mitigations

AGora's proposed corporate structure inherently manages risk – duties, structure, planning processes, policies, regulations and overall accountability processes both assign responsibility and contain risk. All organizations need a structured and methodological approach to coordinate governance, risk mitigation, and compliance. Risks range from strategic risks in markets and value chains, day-to-day operational risks, and financial risk inside the firm (fraud, breach of contract, etc.) and external (interest rate impacts upon borrowing ability, etc.). Each risk requires an appropriate plan of action.

Compliance requires definition of a process and responsible follow up to ensure risks are minimized, the organization responds appropriately when they occur, and the duty to report is honored. Risk management strategies relevant to key elements of this proposal are defined in each chapter.

Corporate Strategy

Risk – Significant change in the client base, operating environment, markets or revenue may impact *AGora's* long-term ability to function.

Mitigations – Conduct periodic environmental scans with the Board and external stakeholders to re-assess and confirm *AGora's* strategic direction. Evaluate options for corporate renewal based on new realities when circumstances change.

Operational Risk

Risk – Loss resulting from failed processes and systems or from external events.

Mitigation: Identify and manage operational risks, with full monitoring and reporting. Assign oversight responsibility to the Board of Directors. Assign responsibility for compliance to the Chief Executive Officer.

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Internal Fraud and Error

Risk – Corporate fraud and malfeasance.

Mitigations – Establish a full suite of financial accountabilities, with responsibility clearly assigned to qualified and capable staff, and with external audit to ensure proper fiscal management. Base policies on best-practice models, including financial governance, signing authorities, roles for audit/finance committees, and controls for financial approvals. Establish transparency for the Board, funding agencies, and the public at large.

Disaster Recovery

Risk – Failure of the technology and data management systems.

Mitigation – Establish and maintain an up to date disaster recovery plan. Define corporate and technology provider responsibilities and describe how operations will be continued in the face of loss of information or systems. Significant work to align data privacy, support providers and staff responsibilities will take place.

Staffing Overload

Risk – Workload exceeds staff compliment.

Mitigations – Seek Board approval and funding for additional resources. Scale back operational activities as required.

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PROJECT MANAGEMENT

AGora will deliver multiple projects. Initial work will focus on establishing the company, defining and initiating pilot projects, and building requisite delivery capabilities. Once established a full range of programs, community engagements and values will be delivered.

Full corporate accountability supports overall project management. Staff will manage projects in accordance with Executive and Board direction. The latest and most efficient project management system – Lean/Agile – will be used to deliver project success.

1. Lean/Agile Project Management

Delivery will be enabled using the well Lean/Agile implementation framework. This management approach is widely adopted in technology sectors - requirements and solutions evolve through the collaborative effort of self-organizing and cross-functional teams and their customer/end user. In *AGora's* case, Agile implementation teams will emerge from those who have been engaged to develop the Strategic Plan. Additional members will develop from this core.

Agile development methods break product development work into small increments that minimize the amount of up-front planning and design. Iterations (or sprints) are short time frames that typically last from one to four weeks that deliver that increment of work. Each iteration involves a cross-functional team working to deliver all project requirements. At the end of the iteration a working product is demonstrated to stakeholders. This minimizes overall risk and allows the product to adapt to changes quickly. See also https://www.scaledagileframework.com/agile-release-train for detail. Work within each Value Stream will be based on the following practices, or Agile Release Train:

- The schedule is fixed – The Value Stream will start at a known time and solutions will be delivered in set increments, aligned with other dependencies, on a reliable schedule.
- A new increment begins every four weeks – Each Value Stream will demonstrate its work to users, stakeholder and other teams at the end of each increment. This solution demo will provide a way to evaluate the working solution with all the teams.
- Priorities are revisited and synchronized across all teams every six to eight months – The next increment of work in each Value Stream will have common start and end dates for all teams within it.
- The Value Stream has a known velocity – Team and Value Stream velocity will be determined using estimation techniques and aggregated so the total capacity for work is understood.

AGora will use an iterative process to create a deep understanding of the desired outcomes identified in the Strategy Roadmap, to rank work activities, and to deliver value as the Value Streams are created. Each team will be led by a leader who is accountable for the team process, events, artefacts, and deliverables. Team members will learn and apply practices from recognized continuous improvement disciplines (Scrum, Kanban, etc.).

It will take some time for teams to become fully functional. *AGora* will initiate delivery by contracting a service provider who is familiar with *AGora's* work.

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Value Streams

AGora's five-year plan is based on four Agile Value Streams (see FINANCIAL chapter) and associated delivery plans constructed from outcomes in the *AGora* Strategy Roadmap. Each Value Stream will develop solutions that benefit the end user. Work has been ranked and scoped in the five-year plan, attached. Priorities will be assessed further when six-month workplans are developed. Value Stream workplans will be developed through a face-to-face planning event every six to nine months. The status of work underway will be demonstrated and evaluated at that time. Teams and management will identify improvement backlog items in a structured, problem-solving process.

Each Value Stream will be resourced by at least one team, with team skills, experience and capability focused on a key value outcome. Each team will have an Outcome Owner and Team Leader. Each team will deliver solutions focused on ranked business cases approved in a large group workshop. They will be charged with meeting objectives and delivering outcomes in line with the business case.

Six-Month Workplans

Teams will work to achieve six-month workplans. Each team is responsible for its own plan. Dependencies, risks, performance, resources, and specific deliverables will be outlined in each plan. Each team – working with other stakeholders – will incrementally develop, deliver, and (where applicable) operate one or more solutions in a Value Stream. Where multiple teams are assigned to a Value Stream, they will be mandated to plan, commit, develop and deploy together. Teams will be cross-functional and will include all capabilities needed to define, implement, field test, and operationalize solutions.

Team Structure and Roles

Each Agile team will have five to nine people and will be anchored with permanent staff from *AGora* and members of the Design Team. Additional positions will be filled with contract resources, volunteers, or resources borrowed from other organizations. Volunteerism will be considered where appropriate. Recruiting the required skills, experience and expertise will be essential to create a capable delivery engine. Team training and orientation related to each challenge will take place to on-board team members and ensure they are effective.

In the first six months teams might include only two to three people. These people will work together to recruit and find others with the best mix of skills and availability to augment their capability. This recruitment process will be overseen and aided by the new Board and management team. Agile delivery will enable the following positions and responsibilities:

- The Team Leader is a unique Agile team member focused on helping other team members communicate, coordinate, and cooperate. This person will assist the team in meeting its delivery goals. They will act as a servant leader who helps teams self-organize, self-manage, and deliver results using effective Lean-Agile practices. The Team Leader will support and enforce Agile processes and other rules to which the team has agreed. They will coordinate with other teams and will communicate the status of their work to management as and when needed.
- The Outcome Owner will drive individual delivery. They will author each business case and will receive a go/no-go decision on the proposed work. After acceptance the Outcome Owner will work with the Agile Team to deliver all activities required to realize business value. After initiation, the Outcome Owner will

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have the ongoing responsibility to steward and follow up with the team on the work. Once the work is completed, the Outcome Owner will turn their attention to the next high-priority action and outcome.

2. Investment Scope, Scheduling, Sequencing, and Dependencies

Project spending and investment decisions will be based upon a full delivery of Agile scoping, scheduling, sequencing and identification of dependencies. This will ensure that risks to project delivery are identified in advance, mitigations developed, and investments approved. *AGora's* Agile delivery and financial oversight methodology will rely upon constructive planning workshops to define work flow, investment requirements and scheduling and team synchronization. At the core will be effective use of funds to deliver the identified product in a timely, efficient and cost-effective way. Please refer to the FINANCIAL appendix for full details.

3. Managing Resources

Human Resources

AGora will seek commitment from community organizations and special interest groups to provide the human capital required to support its work. It has dedicated the Connecting Peoples, Technologies and Farms Value Stream to engaging with the community to recruit, attract and retain resources for Working Groups and Teams.

Infrastructure & Investments

Smart infrastructure projects will provide the foundation for *AGora's* program delivery. Components are connected and generate data that will be used intelligently to create value in the region. The following investments will be made with the smart cities funding:

- Infrastructure Connectivity: *AGora* will invest $1.5M to improve the infrastructure to connect farms through partnership and pilots with new service providers and seek to at least match these funds.
- Direct Economic impacts: *AGora* will spend $5.0M over five years within the communities it is working.
- Social license to Engage and Innovate: *AGora* will spend $0.75M over five years engaging the community in this challenge.
- Improving Farm efficiencies through Technology: *AGora* program will invest and leverage $1.25M to improve farming practices through the application and deployment of Technology solutions.
- Farming Data Investment *AGora* will invest $0.50M to build, analyze and curate the data flow from farms and turn it into an asset.

Financial Resources

AGora will employ a budgeting process that combines annual budget development for ongoing *AGora* operations (staff, overhead, support, pension, etc.) with a 'Lean' budget development approach that supports delivery of project value streams, pilots and specific development initiatives. This alignment will deliver necessary links to outcomes-based project implementation and necessary funding through the Smart Cities Challenge initiative. Full details are outlined in the FINANCIAL appendix.

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Procurement Strategy

AGora's procurement strategy is modelled on Agile best practices and will be supported by full oversight provided by *AGora's* Chief Financial Officer. Full detailing of the process to procure materials, labour, etc., for agile delivered projects is identified in the attached FINANCIAL appendix.

4. Managing Stakeholder Engagement

As part of ongoing operation *AGora* will staff and deploy resources as part of the Value Stream – "Connecting People, Technology and Farms", as described herein.

5. Progress Monitoring and Course Correction

Monitoring, controlling, and reporting strategies and checkpoints for contingencies and any necessary course corrections are identified in PERFORMANCE MEASUREMENT chapter.

6. Related Initiatives Already Underway

We are aware of sustained, long term activities underway in the four Counties for some years regarding the installation and commissioning of numerous tower and mobility based broadband improvements. The continued commitment and funding of a Connected Communities Program Manager and the infrastructure they are deploying in Parkland Country is a demonstration of this on-going support. Investment over the past three years is estimated to be $7.6 million (to December 2019), with a combined four-county estimate exceeding $12 million.

We also know that the Province of Alberta is deeply interested in this subject and have announced the completion of a province-wide Broadband Strategy by sometime in 2019. Moreover, Alberta's SuperNet assets have been sold to Bell and they are in the process of determining their provincial wide strategy to capitalize on that purchase.

The proponents have demonstrated a large and encouraging interest in this initiative. They have a full complement of committed volunteer and municipal partners interested in pursuing these initiatives, alongside a substantial number of potential partner organizations – private companies, governments, academic institutions and community groups.

They will be the horse power we will engage with to deliver on the promise of AGora.

7. Sustainability

The proponents will develop methods to ensure, to the extent feasible, the long-term sustainability of *AGora*. This will be needed to ensure the on-going improvements in rural prosperity in the four Counties and will be necessary to effect scalability and transferability to other Canadian rural regions.

New Integral Strategy Labs™ are planned with the Technology Working Group to springboard from what's been learned to date and also to future proof the technology offerings available. We plan two additional Strategy Roadmap™ processes – first with the farmers, the community and the youth participants to build on and accelerate the Rural Culture of Innovation. A second Roadmap™ process is planned with the Board and *AGora's* corporate partners / participants to build on the evolving

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business model and to consciously design a more robust "Pre-competitive co-design, co-development model" to accelerate innovation and commercialization opportunities.

Finally, while we are not yet able to estimate the scale of the following, we have identified a number of key on-going revenue streams that will be realized as *AGora* takes root and scales up:

- We have secured, via the Data Trust, the foundation for an on-going revenue stream from the data that will be collected, curated and made available – it is expected this revenue stream will grow substantially over time as the data set becomes larger, more comprehensive and more valuable;
- We will realize advertising revenues from appropriate Banner Advertising that will be sold on *AGora's* Regional Commerce Lab;
- We will, from the onset, negotiate with private companies, a pay-to-participate model to allow their access to our innovative testing environment for the purposes of their developing solutions to hyper-local challenges for *AGora* that also have wide-spread commercial application and value;
- We will negotiate shared Intellectual Property right fees from companies that use *AGora* data and its test bed to develop new products they then commercialize;
- We expect to have *AGora* deliver valuable services on behalf of its County partners which will enable them to avoid delivering duplicates services. We anticipate they will contribute funds to *AGora* for those joint, and more effective, delivery of services; and
- Finally, through the retention of an on-staff Grant Writer, *AGora* will be the recipient of numerous Innovation Grants from a number of governmental and philanthropic sources.

8. Risks and Mitigations

AGora's proposed corporate structure inherently manages risk – duties, structure, planning processes, policies, regulations and overall accountability processes both assign responsibility and contain risk. The GOVERNANCE chapter fully articulates roles relative to how projects will be managed, deployed and delivered. Specific to projects, risks will be identified and assessed, enabling decisions to be made about the extent and nature of appropriate interventions. This will be done with stakeholders.

Interventions

Project risks will be evaluated using a scoring system to assess their impact and likelihood of occurring. There are four possible responses:

- Elimination – Where possible, we will act to eliminate the risk.
- Acceptance – When the severity of a risk is lower than our threshold of risk tolerance, we may decide to do nothing about it unless it occurs.
- Mitigation – When the severity of a risk is above our level of risk tolerance, we will act to reduce its impact or the probability of it occurring. The objective is to reduce its severity below our threshold of risk tolerance.
- Transfer – We may decide to move responsibility for a risk with the potential to impact a project to someone outside of that project. The risk does not disappear, but another party becomes accountable for dealing with it.

Each Team will maintain a Risk Register. Accountability for ensuring risks are appropriately managed will be maintained at the overall program level.

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PERFORMANCE MEASUREMENT

Performance measurement is fundamental to understanding when/how/if success is being achieved. The following describes how progress will be measured and reported, and funding enabled.

The Strategy Roadmap underpinning this proposal defines in detail the full range of strategic outcomes to be met over the initial life (5 years) of the company. To deliver these outcomes, *AGora* will:

- Focus on delivering its strategic roadmap by creating long-term goals that define where it ought to go and how to get there
- Understand the environment in which it operates and anticipate how this is likely to change to ensure it continues to meet the needs of stakeholders
- Create a strategic agenda with a future orientation that promotes the long-term sustainability and performance of the organization, aligned with its strategic direction
- Develop business plans that ensure cross-organizational alignment
- Establish a community wellness index to capture the less quantifiable goals like mental health, aging in place and youth attraction.
- Focus on, and measure results and use those results for resource allocation and continual improvement

1. Why, What and How

Appropriate, relevant, aligned and linked performance measures have been established to create a comprehensive Performance Measurement Framework.

AGora's Performance Measures are consistent, integrated and aligned. They deliver clear accountability to achieve results, from senior management to the front-line.

Our approach is based on the fundamental premise that performance measurement, performance management, and the strategic intent of *AGora* must be aligned. The measurement system is simple, spare, and meaningful, and informed by knowledge of how the work of the organization is aligned with strategic intent – answering the questions WHY (what is our purpose?); WHAT (what outcomes need to be produced to achieve it?); and HOW (how will these outcomes be achieved?). From this, specific measures, milestones and payment schedules can be developed, implemented and monitored.

2. The Strategy Roadmap Foundation

The Strategy Roadmap developed by the Design Team is the foundation to the Performance Measurement Framework, and will be further refined in the first implementation phase. Visualizing strategy on a single page, the Roadmap map answers the three critical questions: WHY, WHAT and HOW, with the strategic goal located in the centre of the Roadmap. Impacts linked to achieving the goal are identified on the right. Outcomes that contribute to achieving the strategic goal, and actions required to create these outcomes, are located on the left. Once the Roadmap was done, performance milestones, schedules and payments were linked to the outcomes. They were defined by:

- Identifying outcomes in the map as leading and lagging indicators of performance
- Identifying candidate measures for these outcomes
- Choosing an appropriate metric for each measure

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- Defining the process used to collect and report these metrics
- Defining accountabilities for measurement and reporting
- Documenting the chosen measures and their purpose and use
- Identifying requirements for ongoing maintenance including provisions for modifying the framework as strategic direction and business plans change

Accountability is assigned for every action, and implementation is actively managed by monitoring outcomes. Each stakeholder sees where their contributions complement the contributions of others to achieve the strategic goal. The Strategy Roadmap enables an ongoing focus on outcomes during implementation. By bringing clarity to strategic goals and identifying the actions and outcomes required to achieve them, the map define risks and increases the likelihood of delivering results.

3. Design Considerations

Six questions have been considered in designing the performance measurement framework.

1. Where Will We Measure?

Since the objective is to evaluate how well *AGora* is achieving its strategy, we will measure performance across the entire Strategy Roadmap, with metrics in every capability area. Information will be collected and used to assess progress and adjust the strategy to produce the intended results. If an expected outcome is not being achieved, additional actions or a modified approach will be assessed. If outcomes are delayed due to delays in project delivery, the appropriate response may be to add additional resources or adjust a project timeline.

It is not necessary or desirable to measure every outcome. Rather, a subset of outcomes will be measured that confirm progress – including early, middle and late outcomes in the Strategy Roadmap. Early outcomes — the immediate results of an action — will be monitored to see if actions are having the desired effect. Middle outcomes – representing the combined effect of multiple preceding outcomes – will be monitored to verify that *AGora* is on track to develop capabilities needed to achieve its strategy. Late outcomes will be monitored to verify that it is on track in achieving the strategic goal.

2. What Will We Measure?

When selecting metrics, rigor has been balanced with ease of measurement. The objective is to maximize utility while minimizing effort. By their nature, some outcomes are *verifiable*. That is, they are either achieved or not achieved (the intended product is produced or not produced). Other outcomes are *quantitative* in nature and are achieved by degrees. In this case, we can ask how much or to what degree an outcome has been achieved. Where an outcome is not easily measured, we will consider using a surrogate that can be more easily obtained.

3. How Will We Measure?

Measurement options include:

- A management checkpoint that verifies a project has been completed and the expected deliverables have been created successfully
- Quantitative measurement of a variable that specifies the degree to which the outcome has been increased or decreased, has been eliminated, or is being maintained at a specified level

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- Survey questions based on well-structured rubrics designed to gather external stakeholder input.

4. When Will We Measure?

Frequency of measurement has been considered. Measuring more frequently increases the effort and cost required to collect, manage and report performance. Measuring less often reduces visibility and introduces delays in taking corrective action where measurement identifies a problem.

5. How Will We Manage the Information?

Performance measurement is not a one-time activity. Systemic change is realized over time, and trends are significant. Measuring over time, we expect to see progress toward achieving early outcomes, then middle outcomes, and finally late outcomes. We will implement a repository that stores performance measurement data for *AGora* that allows us to track these trends.

6. How Will We Report the Results?

Information extracted from the performance database will be reported for different purposes and in a variety of ways. The Strategy Roadmap itself can be used as a communication tool and performance dashboard, highlighting progress and areas where intervention is needed.

4. Realizing Outcomes

To ensure delivery occurs on time, on budget and with competency, a complete financial plan and delivery program has been created. Refer to the FINANCIAL appendix for full details. Core to this is identifying the milestone and deliverables necessary to monitor progress. Summary detail follows, with full links to financial performance described in the appendix.

A full delivery plan is articulated in this proposal, specific to the development of internal capacity and the delivery of four 'value streams' that bring life to the company and deliver the large number of technology development initiatives identified herein.

Broadly, delivery is divided into two phases:

1. Phase 1 will establish the necessary corporate capabilities to house *AGora* and its services.
2. Phase 2 is delivery and operations, with initial focus on defining and delivering the requisite pilots to enable hyper-local data collection and rural connectivity, alongside data collection, community enablement, creation of the full spectrum of web-enabled services and ultimately monetization of the data and systems created.

   As the end of the five-year period approaches attention will expand to include positioning of the values developed in *AGora* for deployment and adoption on a Canada-wide scale. Refer to the PROJECT MANAGEMENT chapter and the FINANCIAL appendix for full detailing of the work plans, milestones, outcomes and specific phasing.

By way of example, the full set of outcomes, costs and performance measures are provided, below, for Phase 1. Detailing of how the four full value streams will be achieved is outlined in the FINANCIAL appendix, and linked to the phased delivery plan, funding requirements and the milestones/metrics proposed to monitor progress.

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Measures: Phase1, The Readiness Phase

In order to move from the state of "Proposal Approval" to a working and functioning *AGora*, a six-month readiness phase is outlined. Its main focus is to launch the organization and establish the change program.

The following detailed plan outlines this program in four iterations. Included in the boxes are Action-Outcome deliverables needed to be delivered to prepare the Value Stream for the next 6 months of work. During Iteration 4 the next large group planning session for the following six-month will be conducted. Phase 1 establishment will be achieved through 4 Agile cycles, each delivering progressively more detail and product. (Larger graphics included in the FINANCIAL appendix)

This phase is expected to take approximately 6 months, with all necessary and well-understood complexities of Agile-framed implementation defining the actual time for completion. This is reflected in the outcomes identified and the costing/revenue receipt processes to be negotiated with Canada that will underpin delivery.

5. Monitoring Progress

Using a measure-to-manage approach will allow *AGora* to respond quickly to results of a performance evaluation. For example, based on a report of positive performance, *AGora* will consider assigning more resources to programs that are generating products of significant and expressed value to stakeholders. Less favourable results, on the other hand, may lead to the decision to cancel a program, or to change a program so it produces outputs that are more relevant to stakeholders. The feedback loop supported by performance measurement enables continuous improvement.

6. Achieving Impact

While a $10M funding infusion will provide *AGora* with significant ability to influence actions across the four counties, many of the longer-term impacts will be influenced by multiple external factors outside of *AGora's* direct control. They will depend on achieving widespread adoption and behavioral change.

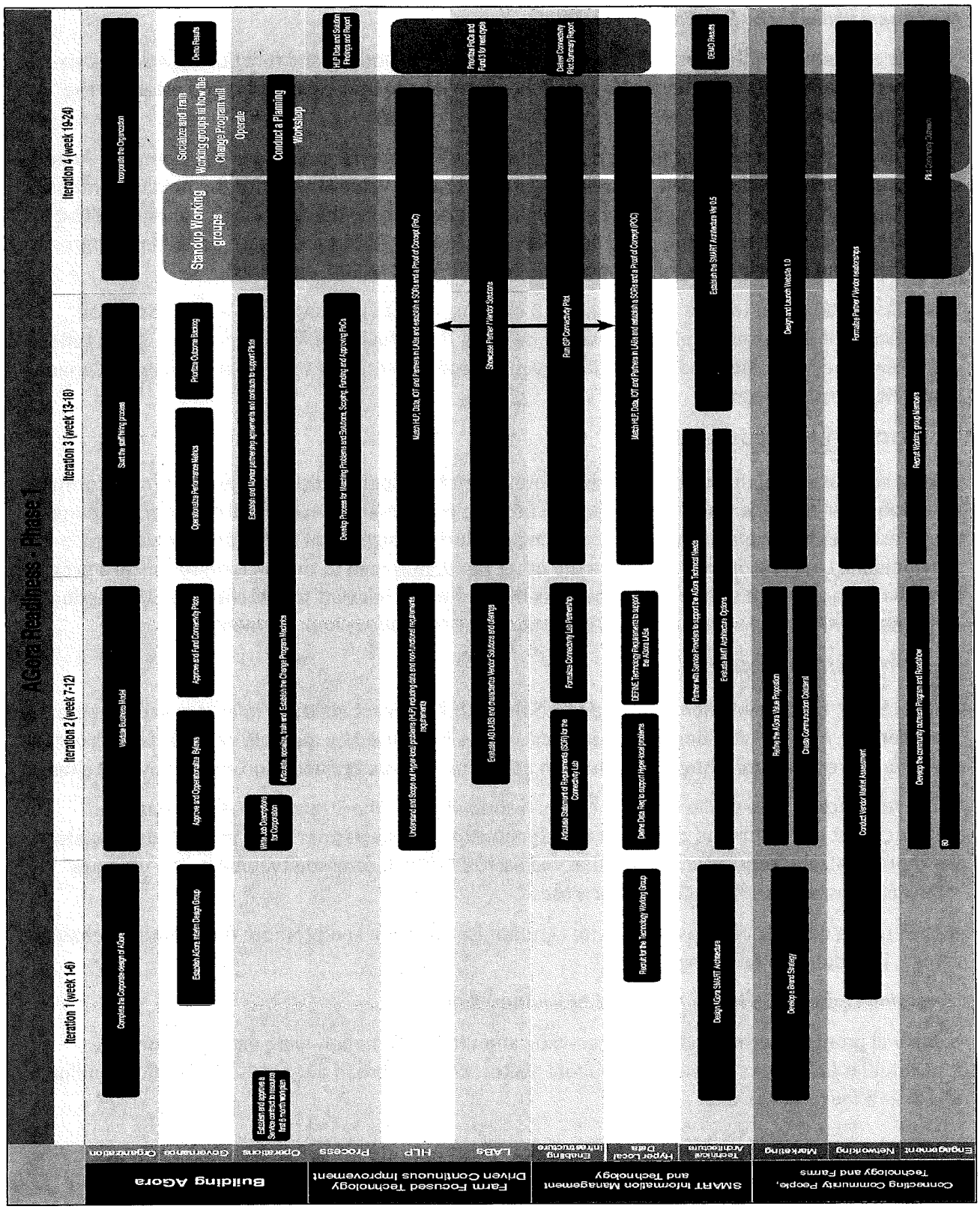
AGora recognizes these challenges and clearly distinguishes in the Strategy Roadmap between outcomes that are within the control of the organization and its partners, and much wider societal, environmental, and economic impacts that will accrue through community uptake. The ultimate impact is "*Prosperity in Rural Canada Increases*."

We will take a number of steps to increase community adoption and promote the required behavioral change, including the following:

Promoting Opportunities in a Renewed Agriculture Sector

AGora will promote region-wide, province-wide and ultimately nation-wide discussion of the opportunities linked to a renewed agriculture sector, creating broad awareness and understanding of a new future for rural Canada.

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Supporting Early Adopters

Change will be led by those who see a new future. *AGora* will engage early-adopter farmers and business leaders and deliver value for them. They will become advocates for change based on their own experience, testifying how emerging communications technologies, data, and decision tools make farms more productive and profitable. This will broaden understanding and increase uptake.

Delivering Financial Benefits

AGora's business model envisages the collection, curation and monetization of data with and on behalf of the farmers and businesses involved. Direct financial benefits will be delivered in multiple forms (better farm practices, improved decision making, revenues from the use of data provided, etc.). In short, by participating in *AGora* farmers and local businesses will benefit financially.

This is expected to incent participation, enhance the value of the data collected, and increase revenue. A virtuous circle is created. Financial wealth should increase social resilience and collective investment in environmental sustainability – a much larger virtuous circle that underpins prosperity overall.

7. The Performance Measurement Framework

The measurement framework links the capabilities, outcomes and actions defined in *AGora's* Strategy Roadmap to performance measures. Data sources are identified. Key capabilities defined by the Design Team support outcome and measure. As capabilities are established and refined, greater certainty on how their linked outcomes are being achieved is defined through specific measures. In turn, these measures support payment through the outcomes-based approach being piloted by Smart Cities. *AGora* is pleased to be part of this leading-edge initiative to create a project delivery model based upon outcomes, and looks forward to establishing best practices that can be used Canada-wide.

8. Risks and Mitigations

AGora's proposed corporate structure inherently manages risk – duties, structure, planning processes, policies, regulations and overall accountability processes both assign responsibility and contain risk. The GOVERNANCE chapter fully articulates roles relative to how *AGora* will achieve results. While using the performance measurement system is not designed to be onerous, knowledgeable and skilled resources will be required to obtain the greatest benefit. From a business perspective, knowledge of the data structures and familiarity with the analytical and reporting tools will be most important. Competent technical support – particularly in database administration – will be essential.

Reporting performance measurements transparently will make a strong statement about accountability to stakeholders. Transparency will encourage dialogue with stakeholders about opportunities to make *AGora* more effective and will help to encourage a more collaborative effort among stakeholders to improve how it works.

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AGORA OUTCOMES
BUILDING AGORA

Roadmap Capability	Key Outcome	Source	Performance Measures
Governance	Independent governance is established	AGora checklist of governance requirements	Progress in implementing independent governance
Governance	The corporate structure and supporting practices are put in place	AGora checklist of structural elements and supporting practices	Progress in implementing structural elements and supporting practices
Governance	Corporate monitoring and reporting is implemented	AGora checklist of monitoring and reporting requirements	Progress in implementing monitoring and reporting requirements
Governance	Performance measurement tools, metrics and processes are established	AGora checklist of required measurement tools, metrics and processes	Progress in implementing measurement tools, metrics and processes
Operations	AGora staff and expertise support long term delivery and growth	AGora checklist of required staff positions and expertise	Progress in implementing staff positions and expertise
Sustainability	AGora is economically sustainable	AGora checklist of sustainability requirements	Progress in implementing sustainability requirements
Scalability and Transferability	AGora is replicable	AGora checklist of required standards, tools and processes to enable replicability	Progress in implementing standards, tools and processes to enable replicability

AGORA OUTCOMES
FARM-FOCUSED TECHNOLOGY-DRIVEN CONTINUOUS IMPROVEMENT

Capability	Key Outcome	Source	Performance Measures
Deliverables	New technologies for data-driven agriculture are used by farmers	AGora checklist of technologies for data-driven agriculture to be implemented	Progress in implementing technologies for data-driven agriculture
		AGora statistics	Adoption trends
		AGora survey	Structured feedback from users on their adoption of technologies for data-driven agriculture, satisfaction levels, and benefits received
Deliverables	Value added agriculture services are integrated	AGora checklist of value-added services to be integrated	Progress in integrating value-added services
		AGora statistics	Adoption trends
		AGora survey	Structured feedback from users on their adoption of value-added services, satisfaction levels, and benefits received
Deliverables	AGora initiatives solve hyper-local problems	AGora checklist of hyper-local problems to be addressed	Progress in defining and baselining the identified problems, matching them with solutions, and deploying solutions
		AGora statistics	Adoption trends
		AGora survey	Structured feedback from users on their adoption of solutions, satisfaction levels, and benefits received
Deliverables	Farms are more productive and profitable	AGora survey	Structured feedback from farmers on changes in productivity and profitability of their farm
		Third-party data	Statistics on farm productivity and profitability
Deliverables	The environmental footprint of farms is reduced	AGora statistics	Waste reduction data
		AGora survey	Structured feedback from farmers on progress in waste reduction
		Third-party data	Regional waste reduction

AGORA OUTCOMES
SMART INFORMATION MANAGEMENT AND TECHNOLOGY

Capability	Key Outcome	Source	Performance Measures
Technology	Infrastructure investments fill connectivity gaps in the region	AGora checklist of prioritized connectivity projects	Progress in completing prioritized connectivity projects
		AGora statistics	Visual map showing connected areas of the region and remaining gaps
Technology	AGora is underpinned by state-of-the-art infrastructure	AGora checklist of required infrastructure	Progress in completing required AGora infrastructure
		AGora statistics	Availability statistics
		AGora survey	Structured feedback from users on infrastructure performance, satisfaction levels, and benefits received
Data Integrity	Farm data is collected and used	AGora statistics	Volume of data captured and used, and the nature of use
Data Integrity	AGora data products are valuable	AGora checklist of required data products	Progress in implementing the data products
		AGora statistics	Use of data products by type
		AGora survey	Structured feedback from farmers, partner and vendors on the data products they use, satisfaction levels, and benefits received

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Data Integrity	AGora technology supports data-driven agriculture	AGora checklist of required technology	Progress in implementing technology
		AGora statistics	Use of technology by type
		AGora survey	Structured feedback from framers on the technology they use, satisfaction levels, and benefits received
Deliverables	AGora provides an R&D Environment	AGora checklist of required functionality	Progress in implementing the required functionality
		AGora statistics	Nature of R&D, number of R&D hours, and AGora capabilities used
		AGora survey	Structured feedback from researchers that they have the capabilities they need, satisfaction levels, and benefits received

AGORA OUTCOMES
CONNECTING PEOPLE, TECHNOLOGY AND FARMS

Capability	Key Outcome	Source	Performance Measures
Collaborators	AGora creates a network of collaborators that includes First Nations, environmental groups, Provincial and Federal Government, the private sector, social sector	AGora statistics	Number and type of collaborators, trends, and the nature and level of their collaboration
		AGora survey	Structured feedback from collaborators on their motivation to collaborate, the nature of their collaboration, satisfaction levels, and benefits received
Collaborators	AGora partners are recruited, trained and serve as Ambassadors	AGora statistics	Number and type of partners, trends, and the nature and level of their participation
		AGora survey	Structured feedback from partners on their motivation to partner, the nature of the partnership, satisfaction levels, and benefits received
Collaborators	AGora attracts champions and early adopters	AGora statistics	Number and type of champions and early adopters, trends, and the nature and level of their participation
		AGora survey	Structured feedback from champions and early adopters on their motivation to enroll, satisfaction levels, and benefits received
Marketing	AGora attracts new users to its programs	AGora statistics	Number and type of users by program, recruitment trends, volume of use
		AGora survey	Structured feedback from users on their motivation to connect with AGora, satisfaction levels, and benefits received
Marketing	The community engages with the AGora program and is involved in its implementation	AGora statistics	Human resources shared, physical resources shared, funds committed to initiatives
		AGora survey	Structured feedback from community members and organizations on the nature of their involvement and their intention to become involved
Marketing	Success stories are routinely communicated to the AGora network	AGora statistics	Communication materials developed, frequency, communication channels used
Marketing	There is broad awareness of AGora's mission and accomplishments	Web statistics	Website visits, product downloads, number of followers on social media
		AGora survey	Structured feedback from community members, partners and prospects on their level of awareness of the AGora and its accomplishments

AGORA IMPACTS
REGIONAL BENEFITS

Domain	Key Impact	Source	Performance Measures
Economy	The regional economy is strengthened	AGora survey	Structured feedback from farm operators and regional businesses
		Third-party data	Regional economic growth, employment statistics, new business creation
Community	Community is strengthened	AGora survey	Structured feedback from community members
		Third-party data	Community demographics, key social indicators
Environment	Environmental quality is improved	AGora database	Aggregated farm data
		Third-party data	Key environmental indicators
Food Security	Food security is increased	Third-party data	Annual cost of food for the average family in the region

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DATA AND PRIVACY

AGora will create and securely manage data on behalf of all data providers. Significant effort has delivered what we believe to be the most effective means to protect these data. Protecting it in ways that build confidence by data providers that the data are, in fact, protected, and providing a fully secure means of supporting use of the data by multiple end users.

Key issues related to open data, sensitive data, data security and data monetization on behalf of the data providers, and others, are outlined in this chapter, the TECHNOLOGY chapter and the TECHNOLOGY confidential annex.

1. Integration of Security and Privacy Considerations in Project Design

AGora will become a Data Trust enabler, working with data producers and consumers to help them to reap the rewards and value from their data assets while contributing to regional and national understanding of Canadian agriculture. Deployment will position the four counties as global leaders in managing and using agriculture data. Further, this platform will deliver system security, control over assets and will assure privacy of materials held.

A Trust in the traditional sense of the word is a three-party relationship in which an asset or value is transferred from a Grantor to a Beneficiary through a Trustee. This "three-node" network creates a trusted relationship between the parties whereby assets can be shared or transferred based on the governance rules of the trust.

A Data Trust takes this concept further and establishes a governance framework – an architecture and supporting technology infrastructure to enable sovereignty and ensure trust related to the data and derivative data assets. It provides a framework for stewardship over these assets for the benefit of the people or organizations in the Trust. Members of the Trust have control and sovereignty over their data assets and relationships between data partners.

The Data Trust includes deployment of distributed software infrastructure that enables data partners to securely share and exchange data with proper equitable and transparent policies and governance structures, while creating a fair balance of power and control between those who produce the data (citizens and clients) and those managing the infrastructure, or processing and using the data.

Importantly, the technology deployed enables control and flexibility in rules and guidelines. It is not prescriptive in forcing specific governance methodologies, nor does it force any data localization methodologies. Members of the *AGora* Data Trust will establish the terms under which data will be used, shared, generated and monetized to meet their needs.

2. Guiding Principles for Data

Data governance is one of the most important public policy issues of our time. Data is the new enterprise currency. It is ubiquitous, and data stockpiles are proliferating. Data collected by the private sector and governments underpins decision-making and boosts economic productivity and

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competitiveness. Protection of this data is central to our long-term prosperity and the preservation of public trust across society.

Data Governance

When data is properly governed, a fair balance of power and control exists between data producers and those who manage technology infrastructure, processing, and/or deployment capabilities. More specifically, an open, transparent and robust Data Trust is required to reap the economic and social prosperity benefits from artificial intelligence – a game-changing invention in which Canada has played a leading role. On a national level, Canadian data should be governed by Canadians.

A Data Trust helps ensure data belongs to and is governed by those who create it. It establishes a governance framework, an architecture, and the supporting legal and technological infrastructure required to enable sovereignty and ensure trust over the data and derivative data assets. It provides a binding framework for stewardship over the data assets for the benefit of the people and/or organizations in the Trust.

Data Accessibility

The Sightline Innovation Data Trust (SID) is the only Canadian artificial intelligence software that creates a circle of trust for data. It enables flexible, transparent, and precise policy definition for all data shared among partners. Additionally, it will provide compliance assurance of policies for both data exchange and data usage. It manages membership changes and policy updates in a Trust while ensuring authenticity of messages and members within the Trust. Lastly, it manages remuneration and value transfer of data that is processed and exchanged between producers and consumers.

Data Security

Included in the governance structure of the Data Trust is the requirement to use industry best practices for data security. The Trust also ensures that all legislative requirements regarding data and privacy, both provincial and federal, are met.

Consent

Consent is integral to the Data Trust. All members, by virtue of being part of the Trust, consent to the terms and governance structure of the Trust. Furthermore, the Data Trust will provide distinctions in governance between data and personal information to provide additional layers of consent.

Data Minimization

Data minimization is typically practiced outside of a Data Trust to limit or reduce exposure to data misuse and/or theft. The Data Trust allows members to maximize their data production in a sovereign and secure manner for monetization purposes. Data is disseminated to consumers (researchers, the private sector, members of the Trust, etc.) to extract value through a secure channel that supports effective data standards, compliance, security and auditing.

Data De-Identification

The Data Trust technology creates synthetic datasets to ensure complete privacy. This creates anonymized features of the real data for analysis – not traceable to individuals or companies. This can

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be done at the farm level and shared within the trust. Full audit trails and tracking of data usage and derivative data usage within the trust is possible through a distributed ledger and smart contracts.

3. Management of the Data Life Cycle

The Data Trust technology creates an agreed upon structure for management of the data life cycle (creation, storage, use, monetization, derivative data creation and use, derivative data monetization, etc.). Specific details governing the data life cycle will be established in conjunction with members of the Trust. This ensures the structure of the Data Trust meets the needs and goals of the members as well as addressing any local requirements. Industry best-practices will guide governance development and inform the processes used for data life cycle management.

The design architecture contemplates and addresses key concerns linked to data collection, analysis storage and transmission, to name a few.

4. Open and Big Data Strategies

Open data is important for innovation. It also is an important part of building trust with citizens. *AGora's* data trust does not force specific governance rules – it will build them with the data providers. Therefore, closed data, open data or hybrids of the two are all compatible with the trust architecture. In fact, Data Trusts enable open data to be executed properly and at scale. Additionally, Data Trusts enable data to be verified prior to being made open and allow the use of that data to be tracked. As a consequence, open data is stronger and more scalable.

5. Compliance with PIPEDA and Other Privacy Regimes

Jurisdictions like India and the European Union have sought to cement data and citizen's rights to privacy as a "fundamental human right." Data movement and control of data has been a leading public policy priority for Europe for nearly a decade, culminating in development of the General Data Protection Regulation (GDPR). Countries have recognized the growing conflict between the value of data and individual privacy and consent. According to the European Commission (EU), by 2020 the value of personalized data will be 1 trillion Euros – almost 8% of the European Union's GDP.

The Canadian Federal government is forming a National Data Strategy. Data use and privacy are defined in the Personal Information Protection and Electronic Documents Act (PIPEDA), the Canadian law relating to data privacy. This governs how private sector organizations collect, use and disclose personal information in the course of commercial business. The General Data Protection Regulation (GDPR) came into effect in Europe on May 25, 2018. This is viewed as a significant update to traditional data regulations, for it defines basic rights for an individual (the "data subject") over their personal data. This has put much greater control into the hands of users and more accountability on businesses that violate the legislation.

The Data Trust enables the participants to define access to data, whether it is personal or non-personal. It does not prescribe or presuppose any rules or regulations. The proposed technology-based solution will establish the means through which GDPR or other regulations are automatically enforced.

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6. Transferability and Replicability of Technologies and Projects

The Data Trust is readily scalable. Other groups in different geographies can be added as a node to *AGora's* Data Trust. Alternatively, the Data Trust can be replicated for other regions so there is alignment in terms of data sovereignty and the freedom to meet local and/or provincial requirements. Regulations around food inspection, for example, may differ between provinces. This could impact goals or user requirements of the Data Trust in other regions.

7. Risks and Mitigations

Of fundamental importance is the protection of data and related privacy of information. *AGora's* proposed corporate structure inherently manages risk – duties, structure, planning processes, policies, regulations and overall accountability processes both assign responsibility and contain risk. The GOVERNANCE chapter fully articulates roles relative to how data security will be managed, deployed and delivered. Central to this are the staff that will be employed – the CTO and others – and the several Policy Frameworks identified in this proposal that will be created in support.

This chapter describes in full both the technology providers proposed for partnership, their security structure and the technology base inherent that will protect data. Central to this is the Data Trust. Guiding Principles establish the foundation upon which risks will be identified, managed and mitigated. Disaster recovery plans, data security, and other will be built from this base, vetted by Executive and ultimately approved by the Board where appropriate.

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FINANCIAL

In line with the competition guidelines, a budget has been developed that will fully invest upwards of $10M to be made available over a five-year delivery period.

The following budget detail is provided by phase (establishment/operation), value stream, and year. Value streams are modelled on Lean/Agile methods, and key initiatives grouped thematically.

1. Project Budget

During the first five years, work will be delivered in two broad phases, with Phase 1 delivering necessary corporate capabilities to house *AGora* and its programs. Phase 2 is delivery and operations, with initial focus on defining and delivering the requisite pilots to enable hyper-local data collection and rural connectivity, alongside data collection, community enablement, creation of the full spectrum of web-enabled services and ultimately monetization of the data and systems created.

As the end of the five-year period approaches attention will expand to include positioning *AGora* for deployment and adoption on a Canada-wide scale. Refer to the PROJECT MANAGEMENT chapter and the FINANCIAL appendix for full detailing of the work plans, milestones, outcomes and specific phasing.

Approach

Delivery will be enabled using the well understood Agile implementation framework. This proven approach is widely adopted - requirements and solutions evolve through the collaborative effort of self-organizing and cross-functional teams and their customer/end user. In *AGora's* case, Agile implementation teams will emerge from those engaged to date, with the Strategic Plan, Strategic Design team and consultants involved establishing the core members that will create the company. Members, products, timelines structure and processes will develop from this core.

Significant financial detail is provided on Phase 1 - establish *AGora* corporate operations. This is intentional, as this is the first most critical phase. Moreover, once a Board of Directors and an Executive Team are in place, they will be expected to take an active role in defining how the following work will be achieved, in accordance with this initial plan.

Phase 1 establishment will be achieved through 4 Agile cycles, each delivering progressively more detail and product. This phase is expected to take approximately 6 months, with all necessary and well-understood complexities of Agile-framed implementation defining the actual time for completion. This is reflected in the outcomes identified and the costing/revenue receipt processes to be negotiated with Canada that will underpin delivery.

Phase 2 will maintain the Agile approach and philosophy. Delivery cycles will be defined and delivered to the newly constituted Board and Executive in advance of approvals to proceed.

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2. Financial Management

Fiscal oversight will be provided first through existing administrative support of Parkland County. Once *AGora* is established, a Chief Financial Officer will be employed and deliver Generally Accepted Accounting Principles (GAAP) processes to establish full financial accountability, including audited financial statements.

Budget Structure – Value Stream Summary

The following budget summarizes investment by delivery Phase and Value Stream.

Value Stream	Phase 1	Phase 2	Total
Building *AGora*	2.4%	54.0%	56.4%
Farm Focused Technologies	0.3%	5.7%	6.0%
SMART Information Management	4.3%	26.3%	30.6%
Connecting People with Technologies	1.1%	4.5%	5.6%
Sub-total	8.1%	90.5%	98.6%%
Total hardware (all phases/streams)			26.2%
Tax on hardware			1.3%
Total			100%

The FINANCIAL appendix attached provides full detailing on cost elements that are defined along the four Value Streams. These Value Streams consolidate functions into delivery requirements and deliver cross functional alignment.

1. Activities associated with establishing, staffing and running the company are grouped into "Building *AGora*" Value Stream.
2. Activities related to on-farm capabilities are housed in the "Farm Focused Technology" Value Stream,
3. The "SMART Information Management & Technology" Value Stream identifies all cross functional requirements to establish and maintain the systems that will underpin *AGora*, data trust and data oversight, as well as architecture design requirements.
4. The final Value Stream – "Connecting People, Technologies and Farms" lays out specifics on how community engagement and understanding will be achieved.

Building AGora

This Value Stream is the core of *AGora*. It will deliver the organization that will anchor, lead and oversee all *AGora* work, including corporate design, organization, governance and operations. Initial work focuses on creating the company, defining bylaw, operations, policies, etc., that set *AGora* on a positive course. Operational costing reflects what is expected of a new firm – Human Resource, governance and operational requirements to deliver, pursuing additional partnerships and revenue sources and the like.

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Farm Focused Technology Driven Continuous Improvement

This Value Stream is the critical connection of *AGora* to the farms, farmers and communities that are volunteering as early adopters. It will establish the requisite capabilities for on-farm data collection and support software design and delivery through the first five years of *AGora* operations. Through discussion with early adopter farmers, the specific hyper-local challenges will be identified, appropriate data collection systems modelled and put in place, and a process to derive value from the data collected will be defined.

Fundamental to the success of this value stream is the participation of the early adopter farmers, proper framing of the problems to be addressed and the development of decision support tools that will flow back to the farmers to improve on farm decision making.

SMART Information Management & Technology

This Value Stream is *AGora's* technological backbone with three main themes: Connectivity infrastructure, hyper-local agricultural data and SMART architecture This value stream consolidates the technology requirements to both establish *AGora* (GIS systems, etc.), pilots that will determine how other infrastructure (electric/gas) can be effective delivery agents for connectivity, data cleanup and overall proofs of concept tied to software that will deliver value to the data providers and beyond.

Connecting People, Technology & Farms

This Value Stream is the key connection between *AGora* and the community at large. It will establish *AGora's* brand and key value statements. Networking, marketing and engagement underpin activities. Delivery of a community engagement, community outreach and leadership development process is framed in this section. Branding, web management and social media are costed into this stream. A full marketing plan has been developed that will underpin initial activities of this stream.

3. Budget Structure – Annual Investment Summary

Value Stream - Theme	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Building *AGora*	$ 794,050	$1,188,100	$1,254,603	$1,216,643	$1,189,234	**$5,642,629**
Farm Focused Tech Continuous Improvement	$ 56,000	$ 100,000	$ 127,500	$ 155,000	$ 160,000	**$ 598,500**
SMART Information Management and Tech	$ 420,000	$ 630,000	$ 685,000	$ 675,000	$ 650,000	**$3,060,000**
Connecting People Technology and Farms	$ 159,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000	**$ 559,000**
SUB-TOTAL	$1,429,050	$2,018,100	$2,167,103	$2,146,643	$2,099,234	**$9,860,129**
Hardware - All Streams	-	-	-	-	-	**$2,623,00**
Applicable taxes						**$ 131,150**
TOTAL	14%	20%	22%	21%	21%	**$9,991,279**

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The above table describes the investment to be made in the first five years of activity. Overall, approximately $5.64M will be directed towards establishing human resource capacity across the four counties and to deliver programs. Fully defined on farm investments that will enable state of the art connectivity and data collection comprise approximately $0.60M. In addition, *AGora* will invest approximately $3.06M in technology design, proof of concept and technology development. Investment in community awareness, capacity development, and engagement accounts for an additional $0.56M. On balance, approximately 20-22% of total investment will occur each year, with relatively less required in Year 1. (Please note that summary detail in Section 5 details investment by infrastructure type, not Value Stream)

4. Methods, Sources and Assumptions to Deliver Confident Cost Estimates

Identification and compilation of required costs to deliver upon (1) the initial proposal; and (2) the strategy defined by *AGora's* Design Team was a core requirement of contracts tendered under the $250,000 grant to develop this proposal. Each contract included a costing exercise, ranging from delivery of a long-term marketing plan, infrastructure to enable connectivity across the four counties, the various pilots and labs, to staffing and operational support. Details of these contracts are provided in the following section, Reporting on Use of the Finalist Grant.

Specific contracts defined the organizational structure required to implement *AGora*, including human resource, operating and core infrastructure costs and additional policy/design requirements. Costs, implementation design, partnerships, and timelines were developed for the proposed pilots and labs. Overall, level 2 (at a minimum) cost estimates were provided through contract.

- Infrastructure Deployment & Requirements: Taylor Warwick Consulting Ltd. summarized broad costs for full connectivity and delivery.
- Initial Corporate Creation: Integral Strategy Network Inc. defined required elements to take the strategic design from concept to reality over the first delivery phase of the project. The strategic roadmap defined the core elements for *AGora* creation. Each element was costed in consultation with sector experts, both internal and external to the firm.
- Marketing and Community Engagement Plan: Kumpula Design Inc. delivered a full marketing and communications strategy for *AGora* creation and implementation.
- Annual HR, Operating and Deployment Costs: Integral Strategy Network Inc. defined the annual cost of operating *AGora*, based on design considerations identified by the Design Team. Core delivery requirements inside *AGora* were developed based upon outcomes defined in the Strategy Roadmap. Input from organizations of a similar scale, like TECTERRA, were benchmarked.
- *AGora* Technology Platform: Ventus Development Services Inc. confirmed GIS as a core component of the technology platform. Discussion with ESRI Canada and others confirmed that this platform could be implemented, and the cost of its implementation and operation. Costs were cross-verified by Ventus and ISN prior to our including them in the financial plan.
- *AGora* Data Trust Enablement: Integral Strategy Network Inc. discussed Smart Cities Challenge conditions related to privacy and security with technology experts and confirmed costs required to host, manage and support secure tracking and monetization of data in a data trust environment ensuring the appropriate protections are in place.

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- Infrastructure Pilot & Implementation: Ventus Development Services Inc. defined technology requirements, development partners, costs, timing and risks associated with a series of pilot projects *AGora* will deliver. These initiatives have been included in *AGora's* roll-out plan.
- Consolidation and Alignment: All cost elements were brought together by Integral Strategy Network Inc. as part of this proposal development process. Key cost elements were vetted for consistency, accuracy and applicability and integrated into the budget and the workplan.

5. Contributions from Other Sources

Significant support for *AGora* has been obtained from external sources. Fifty-five letters endorsing the proposal gives confidence to the proponents of core viability, private sector interest in moving forward in alliance, academic support, and overall interest in cost sharing and participating in future activities.

Support is broadly aligned with the implementation process, with firm external support in place to establish *AGora*, to be confirmed once the company has been established.

Support to Establish and Maintain the Corporate Structure

Specific financial and non-financial contributions underpin initial establishment. Significant work is required to create the company, as identified in the GOVERNANCE chapter, to deliver the central outcome of "*An effective delivery structure is established*." To this end, a stakeholder group will be created, and they ultimately will form the core of the Board of Directors. Each has indicated interest and is willing to provide in kind time and effort in support. These efforts are estimated as follows:

- 2 Board meetings/month for 9 months and then 4 per year thereafter = $153,000;
- 1 Technology Working Group meeting/month for 9 months and then 6 per year thereafter = $148,500.

Parkland and participating counties have agreed to provide logistical and administrative support to establish *AGora*. This includes significant effort by Ms. Barb Scully, who will maintain her role of lead project coordinator, salaried through Parkland County. Administrative and accounting support also will be provided.

- These contributions are estimated at $130,000.

Integral Strategy Network Inc. (ISN) will deliver corporate establishment and work in partnership with the emergent Board of Directors, the respective counties, other consultants as required, and legal firms to 'stand up' *AGora*. ISN has been involved since inception, and discussions confirm ongoing interest in maintaining continuity in support. ISN has committed to providing support at a reduced cost (50% discount) that recognizes the future potential of *AGora*.

- This contribution is estimated at $441,500.

Technology Providers for AGora Operations and Infrastructure Pilots

Technology providers have indicated interest and confirmed support. Most significant, four energy utilities will provide time and effort in support of proofs-of-concept through the Regional Connectivity Lab pilot projects. FortisAlberta, EQUS REA Ltd., ATCO Gas and Zayo Group have all confirmed their interest in participating in pilot initiatives to assess how their existing infrastructure can be used to support broad deployment of rural communications technologies. **This is considered a fundamental**

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achievement. The ability to collect and move information cost-effectively in a rural region is essential. *AGora* will determine how this will be achieved through the participation of these companies.

Other technology providers have confirmed interest in helping to establish *AGora* core operations. Both ESRI Canada Inc. and Sightline Innovation Inc. have expressed interest. Sightline Innovation has offered their family of Data Trust platform technologies and has confirmed the participation of their Chief Technology Officer, Dr. Mark Alexiuk, in the Technology Working Group. ESRI Canada has offered their family of GIS technologies. Future discussion will fully define each of their respective roles. Niche vendors exist that offer translation from Latitude/Longitude co-ordinates to Premise ID, the foundation of location for Livestock and Poultry movement.

- Detailed discussion between the project proponents and Sightline Innovation Inc confirmed their support. They will provide $100,000 in kind contribution towards the project.

Technology providers/research interests; data access and software development

Numerous firms have confirmed interest in participating with *AGora* in design and delivery of software tailored to a rural agricultural clientele. A number of Application Labs will be initiated in partnership with private sector interests, academia and government. This will enable the Labs and deliver decision support and other tools necessary to take full advantage of the data to be managed by *AGora*. These Labs will be established later and, no fixed cost, fixed price, or fixed amount of external contribution has been assessed at this time.

- Detailed discussion between these companies and the Parkland Smart Connected Communities Program Manager in the development of this proposal has conservatively estimated the value of these contributions at an additional $10M.

6. Tools Utilized

AGora will receive accounting and administration support from Parkland County, as noted above. Its accounting systems and practices are compliant with Canada's Generally Accepted Accounting Principles. They have been vetted by Alberta Municipal Affairs. Furthermore, we have included in *AGora's* budget professional accounting services and Annual Audited Financial Statements.

We also will ensure we are fully compliant with any Contribution and Reporting agreements required by Infrastructure Canada and the Canada Revenue Agency, should our proposal be successful.

7. Reporting on Use of the Finalist Grant

To develop and deliver a successful proposal the Smart Cities Challenge provided $250,000 to Parkland and its partners. All funds were used directly in support of this proposal. Five contracts totaling $250,000 were released through an invitational tender process to secure the best proponent and link products to required outcomes that now drive the proposal itself. Proponents were selected in fall 2018, and contracts were developed to deliver specific project components, based on Smart Cities Challenge design criteria. Contract oversight was provided by Parkland County's Connected Communities Program Manager, Ms. Barb Scully, with contract administration provided by Parkland's financial administration office.

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The following table summarizes the use of funds.

Tender Recipient	Select Deliverables
Integral Strategy Network Inc.- $50,000 - September 27, 2018 - Sustainability Strategy	Create a long-term strategy that would see the incubator be successful and expanded beyond our region after the initial development to include and be available to all areas of rural Canada. Look at opportunities that will create a financially sustainable future for the Incubator past the award dollars being used. Create a list of stakeholders and what their contribution could be towards the sustainability of the Incubator.
Ventus Development Services Inc. - $50,000 - September 28, 2018 - Virtual Ag Incubator	Develop a mandate and role for the organization. Review and assess similar global centres for Ag innovation. Define necessary conditions for success, organizational design, partnerships to be engaged, competitive advantages to be sought, staffing, applications and platforms required to be delivered and capital/operating requirements to bring life to the initiative. Define broad timelines for implementation.
Kumpula Design Ltd. - $50,000 - September 27, 2018 - Marketing and Communications Plan	Deliver a series of community events to continue and enhance the Smart Cities community engagement efforts accomplished to date. Further engage residents and businesses to gather input into the design of the Smart Cities Strategy, and components of the Living Lab. Build widespread understanding of what will be possible as the Parkland Smart Community plan continues to be fully implemented. Deliver an effective, long-term outreach plan to keep residents informed throughout the implementation phase will be needed.
Taylor Warwick Consulting Ltd. - $50,000 – September 27, 2018 - Infrastructure Assessment and Plan	Deliver a complete review and gap assessment on the installed broadband infrastructure in all participating Counties. Recommended approach to resolve gaps and recommendations regarding core technology choices to deliver equitable internet/cellular access for residents and businesses in the region. Summarize broad costs for implementation and delivery.
Integral Strategy Network Inc. - $50,000 - 27 September 27, 2018 - Strategy and Final Application	Form and brief Strategy Roadmap design team; build strategy. Conduct "information interviews" to obtain opinions from those influencers who need to be consulted (as required). Ensure regular input and communication with and from the other consultant teams and Parkland County's Project Manager. Develop, coordinate and consolidate information from other teams. Develop overall Smart Cities Challenge submission.

8. Risks and Mitigations

AGora's proposed corporate structure inherently manages risk – duties, structure, planning processes, policies, regulations and overall accountability processes both assign responsibility and contain risk. The GOVERNANCE chapter fully articulates roles relative to financial management and control will be delivered.

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IMPLEMENTATION PHASE REQUIREMENTS

This chapter describes plans to meet applicable municipal, provincial, and federal reporting and legislative and policy requirements. Much is formative, and will be actioned following selection.

1. Compliance with Reporting, Legislative and Policy Requirements

As AGora is not yet an incorporated entity it is not in violation of any municipal, provincial or federal laws, regulations or policies. As a matter of doing business, AGora will ensure the requirement for compliance with these rests with the Board along with a formal responsibility placed on the AGora CEO and CTO to ensure these are monitored and complied with over time. We have also established a relationship with Service Alberta to advise us and to assist in this regard. Once operational, AGora will identify and establish similar relationships with appropriate municipal and federal entities.

2. Duty to Consult with Indigenous Groups

Recognizing that the region's agricultural lands were originally those of the Indigenous people *AGora* will take extra care to ensure they have the opportunity to provide input and influence the initiative – during the proposal phase as well as moving forward. This will include recognition of rights, respect, co-operation, and partnership with our Indigenous neighbors.

In forming this final proposal, we engaged Enoch Cree First Nation and Paul First Nation as future collaborative partners and have received letters of support from both Nations' Chiefs. We have identified that *AGora* had several agriculture areas that will support goals of partnering with the Nations in areas such as food security, education, technology and connectivity. Upon awarding of the Smart Cities Challenge prize, we will extend our engagement to all Indigenous communities in our region as well as the urban Indigenous community in neighbouring towns and cities.

We also have created a collaborative relationship with the Metis technology business 3CIS. 3CIS specializes in rural connectivity with a history of working in rural municipalities and First Nations communities, as well as a background in software and technology solutions. We also have consulted with the Technical Services Advisory Group (TSAG), a not-for-profit provider of technical and advisory services for First Nations in Alberta. TSAG is mandated by the Chiefs of Alberta and takes direction from a Chiefs Steering Committee and Board of Directors, which include representatives from Treaty 6, Treaty 7, and Treaty 8.

Modern Treaty Obligations

We are not aware of any modern treaty rights applicable to this region.

Reconciliation and strong and sustainable communities have been discussed in outreach conversations with neighbouring First Nations. *AGora* is committed to these objectives as a basic principle and will works towards these ends in its delivery, in its full implementation and roll-out of initiatives.

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3. Community Employment Benefit (Employment and Procurement Opportunities)

If awarded the $10 million, *AGora* will participate in the community employments benefit initiative. As a region we recognize that increasing employment opportunities is a win for all – including helping to employ the underemployed, creating a regional knowledge workforce that can become sustainable and successful, and creating more opportunities for small, medium and social enterprises. By creating a target and an implementation framework we have the means to grow the local economy while participating in the larger global economy.

According to the government of Alberta (https://investalberta.ca/industry-profiles/agri-foods/)

"Alberta offers a high-quality supply of primary products and is the third largest exporter of agri-food products in Canada. In 2017:

- *Alberta exports of primary and processed agricultural and food products totaled $11.2 billion.*
- *Alberta produced 33 percent of Canadian wheat, 32 percent of canola, nearly half of the nation's barley, and 16 percent of Canada's oats*
- *Alberta led the nation in cattle and calf inventory, accounting for more than 40 percent of Canada's total*
- *Alberta's agri-food industries employed 75,100 Albertans: 52,100 in primary agriculture and 23,000 in food and beverage*
- *Alberta's food and beverage processing industry was the second largest manufacturing employer in the province in 2017, employing 23,000 people, and accounting for $14.4 billion in manufacturing sales."*

Given these statistics we know *AGora* can increase employment opportunities for Indigenous peoples, women, and youth; and procurement opportunities for small-sized, medium-sized and social enterprises. We will establish an outreach program to make these opportunities known to these segments in the four counties.

In the phased approach we will take in developing *AGora* we know we will see an increase in training and employment opportunities for the listed groups. As *AGora* begins to grow in both scope and users, we expect it to attract new agri-food opportunities and larger private enterprises.

There is opportunity for under-employed people in the region from the cottage industry processor to larger facilities. Through *AGora* support we can grow agricultural production for women in agriculture and transfer agricultural opportunities to youth with succession planning. There also will be multiple procurement opportunities for goods and services provided by small, medium, and social enterprises.

AGora Innovation Labs are specifically geared to improving regional opportunities for these target populations. We have benchmark information collected in 2016 and propose not only to target improvements in these areas, as identified in the table below, but also will revisit these benchmarks and re-establish new targets annually.

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SECTOR	CURRENT SITUATION[1]	TARGET	SOLUTION
Indigenous Peoples	Known labour market gaps and underemployed workers in the region	2% increase annually	Through *AGora* supports and specific outreach programs we will grow agricultural production opportunities for Indigenous peoples in the Region, particularly in agriculture and food security
Women	Known labour market gaps and underemployed workers in the region	5% increase annually	Through *AGora* supports we will grow agricultural production opportunities for women in agriculture
Youth	Known labour market gaps and underemployed workers in the region	5% increase annually	We will expand agricultural opportunities to regional youth through a focus on improved succession planning
Small, Med and Social Enterprises	Unknown	10 new contracts awarded	We will target requests to these companies to supply goods and services to *AGora* and its participating partners

1. Sourced from "Parkland County – Labour Market Profile, December 2017". Completed by Applications Management Consulting Ltd. for Alberta Labour and partners.

4. Climate Lens Assessment (Climate Impacts)

As a result of the projects outlined, we expect a number of positive impacts on climate change adaptation and mitigation as well as Canada's climate change-related goals. In particular, we foresee positive changes that will create an indirect reduction in greenhouse gas (GHG) emissions.

We foresee a positive and direct impact on climate change adaptation goals. In particular, *AGora* could develop a micro-climate monitoring system that would reduce the impact of flood and drought on local agricultural operations. Although these impacts are not expected to be significant at the national scale, our work to date believes they are significant at the community level.

Parkland County estimated an annual total of 453,860 tonnes of GHG emissions in 2010, with transportation being the highest contributor. A slow but steady increase was anticipated based on a 1.4% average annual population growth rate. This initiative could reduce these emissions.

In recent years, Parkland County has declared agricultural states of disaster due to both drought and high precipitation events. When local wildfire events are included, proposed development of a climate monitoring system will be significant for local agricultural producers. Innovations from *AGora* will support initiatives led by all counties to reduce the risk of climate change impacts in agriculture – including the Alternative Land Use Services Programs (ALUS) and the Modeste Natural Infrastructure

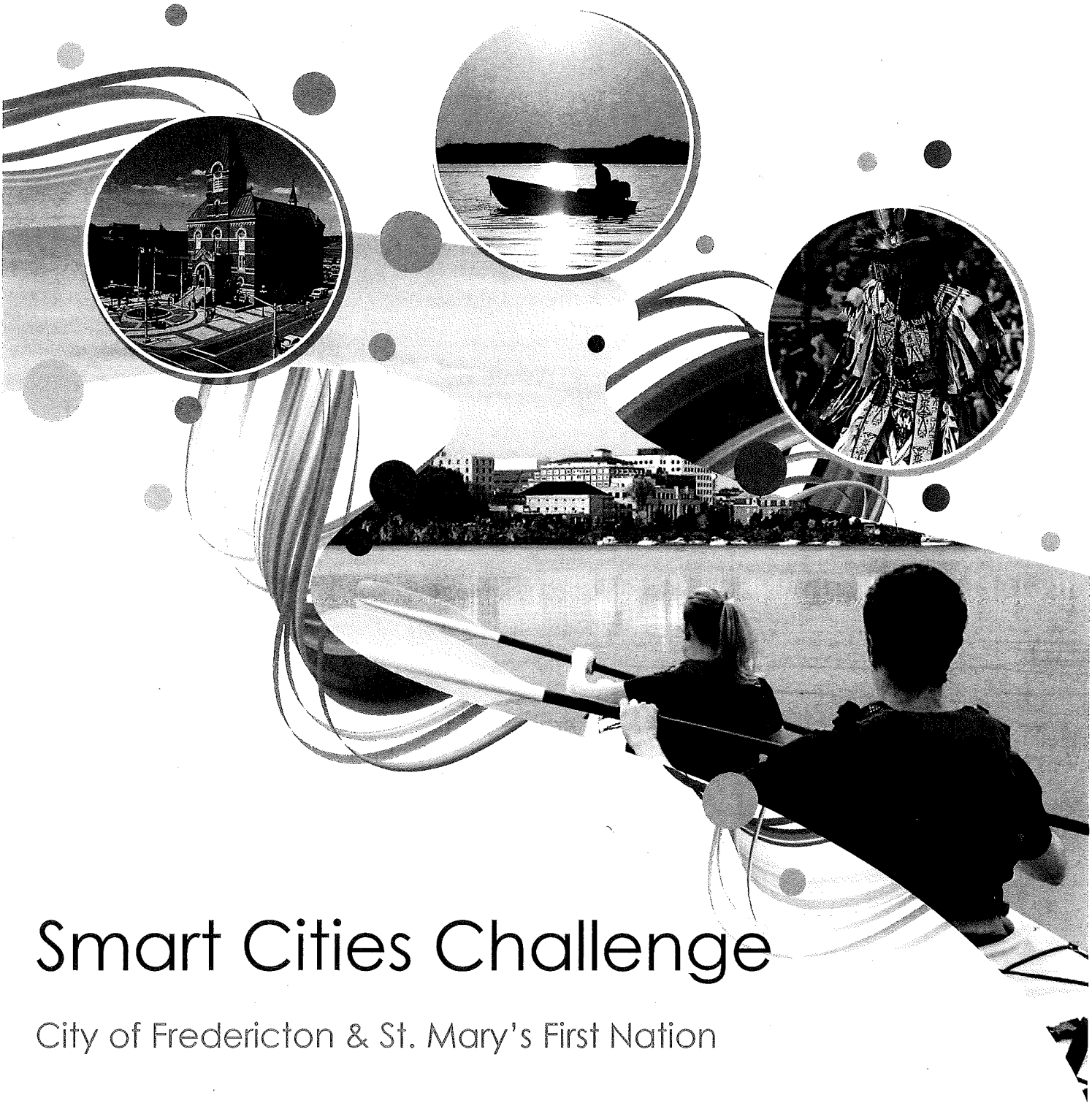
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Project, both of which attempt to increase ecosystem service delivery regionally through beneficial management practices on agricultural land.

5. Other Applicable Laws and Regulations and Policies

Legislative and regulatory compliance rests with the Board; the CEO, CFO and CTO will be accountable for ensuring these requirements are monitored and complied with over time. We have already established a relationship with Service Alberta to advise and assist us in this regard. Once operational, *AGora* will identify and establish similar relationships with the appropriate municipal and federal entities.

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Smart Cities Challenge

City of Fredericton & St. Mary's First Nation

March 2019

Fredericton

ST.MARY'S
WOLASTOQIYIK

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A City to Like, Share and Follow

A poem written for the City of Fredericton & St. Mary's First Nation joint Smart Cities initiative (read at the joint Council briefing on January 30, 2019)

On the bus ride home, I watch a video of a Fredericton 5th grader who used her allowance to buy coffeeshop gift cards for the homeless in her neighbourhood. It's been a Shakespearean winter for those living rough, one of discontent and thin tents— a child can see that. I want a city as compassionate as that 10-year-old, chatting with strangers outside the community kitchen like she's with old friends; a city as warm as the hand-knit scarves tied around street poles and fences alongside the water treatment plant for those in need of heat, of comfort. I want a city that recognizes me in the same way that the vendors at the Boyce Farmer's Market do on a busy Saturday morning, knowing my name and what I do for a living, that the Guinness aged cheddar I buy pairs well with the sweet apple cider from the next stall over, that I live around the block and it's a short walk. I want a city that's a friend and an ally to St. Mary's First Nation; a city that connects with its residents like the Bill Thorpe marries the North and South sides. I want a city old as the Wolastoq River and as current so fewer friends leave to go out west and instead take root, I want to retain our youth. I want a city as smart as its population, as its university town reputation: UNB and STU, NBCC and the College of Craft and Design nourishing artists and scholars, blue-collars and doctors. I want a city that's accessible, easily navigable, multilingual, a city that is a home, a safe-haven, a welcome wagon. I want a city that's tech-savvy and customizable, a city to like, share, and follow.

Written by Jenna Lyn Albert, Poet Laureate for City of Fredericton

City of Fredericton & St. Mary's First Nation Partnership



St. Mary's First Nation Band Council and Fredericton City Council at their joint gathering on January 30, 2019.

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Executive Summary

Our original **Challenge Statement** that we created for our application is:

> My city does not recognize me or connect me to what matters most; Fredericton will collaborate with First Nations to create an accessible, welcoming, supportive city for youth, newcomers, and an aging population, empowering everyone with a Personalized Inclusion Plan that connects people to create an exceptional quality of life.

Over the course of the finalist phase, we engaged further with stakeholder and residents, tested out concepts and ideas, and refined our **Vision** for our Smart Cities Proposal:

> Fredericton & St. Mary's First Nation are collaborating to create an accessible, welcoming, supportive community, starting with youth, newcomers, older adults, and persons with mobility-related disabilities; recognizing what is important to individuals and connecting them to what matters most, empowering residents with personalized digital tools, data & technology that enable them to create an exceptional quality of life.

To achieve this vision, we're proposing to carry forward the main initiatives that we set out in our original application, including the **Digital Fredericton** transformation initiative, the **Digital Community Hub** (formerly Smart City Dashboard/Real-Time Census), as well as three other community initiatives: **Doorable**, **Non-Profit Data Collaboration**, and **Road Home Digital Platform and Enablement.**

The initiatives we're proposing will offer more meaningful ways for community **Engagement**. We're using human-centred design to involve residents throughout the process of designing solutions, tailoring them to their unique needs. We've developed a unique model to discover who our residents are, gain deep insights about their aspirations and challenges, generate ideas for solutions, and co-create and test solutions with the community. We've piloted this approach with the key initiatives during the finalist phase, which generated key insights guiding this proposal and leading to the creation of four prototypes. We've also widely and deeply engaged community stakeholders throughout our Smart Cities Journey, developing partnerships and working relationships to deliver the initiatives in this proposal.

We've scoped out each of the key initiatives in **Project Management**, defining the goals and deliverables and resource requirements, while using an overall, coordinated approach for procurement, communications, risk management, and monitoring/managing issues.

We built our **Performance Measurement** plan across three strategic areas, aiming ultimately to achieve our vision to through three long-term outcomes:

- Developing a detailed community profile with richly defined segments and needs.
- Providing more efficient and targeted services that address needs, working in an end-to-end environment that puts resident engagement first.

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- Connecting people to what matters, increasing inclusion through the uptake of personalized digital tools.

We've developed the deliverables and performance milestones that will trigger progress payments of the prize money. We've also outlined an approach to monitor, report and evaluate progress on performance at monthly and quarterly intervals

We have crafted a **Technology** architecture to achieve these outcomes, creating new user experiences and rich data sets and augmenting the workforce. We've designed the architecture across layers – from sensors and edge devices through to smart algorithms. Our technology selections are guided by principles to ensure interoperability, extensibility, scalability and replicability to achieve and sustain our technology vision. The technology architecture will be able to respond to rapidly changing technology environments. The proof of our technology is in the prototypes. We've demonstrated all layers of the technology architecture in action to provide sharply tailored personalized experiences using connected technology and data.

In terms of **Governance**, our Fredericton Smart Cities Task Force will oversee the implementation of our Smart Cities proposal. The Task Force includes representatives from City of Fredericton. St. Mary's First Nation, committee leads for the main initiatives and as well as stakeholders to provide academic, commercial and social oversight. The City and St. Mary's also intend to enter into a Friendship Accord, which will build on the governance structure to offer a framework for continued collaboration on this and other broader community issues of mutual interest. We have plans for program administration and implementation and have developed a number of partnerships with stakeholders to deliver our proposal outcomes.

We went through an intensive process to develop a plan for **Data and Privacy**, particularly as it relates to protecting personal information. We've completed a PPIA that examined each of the main initiatives in our proposal and outlines the risks related to privacy and planned measures to minimize those risks and comply with privacy legislation and standards. We've summarized those risks and plans to protect data and privacy in this proposal.

To meet the **Implementation Phase Requirements**, we've outlined the approach that we will use for consultation between St. Mary's First Nation and City of Fredericton, as well as our intention to provide employment and/or procurement opportunities for youth/ Indigenous peoples, small-to-medium-sized social enterprises, and women under the Community Employment Benefits initiative.

As part of the **Financial** plan, leveraging other sources of revenues and investment to increase the impact of the initiatives, including investments from the City of Fredericton, its wholly-owned subsidiary e-Novations Comnet Inc., and in-kind investments from technology partners. We used similar experiences, industry standards, estimates from vendors for specific items, agile development, and detailed cost breakdowns of project subcomponents to estimate costs and minimize finance risk.

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Vision

> "Not everyone has the same needs & wants – but everyone has needs and wants."
>
> **City of Fredericton Mayor Mike O'Brien**
>
> "Everyone matters. The City of Fredericton and St. Mary's First Nation are thinking outside the box so that we can develop and plan for today, tomorrow and the future."
>
> **St. Mary's First Nation Chief Alan Polchies Jr.**

Imagine a *Smart City* where all residents are recognized and connected to digital services and resources they need 24/7 on a personal, interactive level.

Imagine an *Accessible City* where there are no barriers, doors wirelessly open, and you can easily find available, wheelchair accessible parking.

Imagine an *Inclusive City* where no one is left behind, and the most vulnerable are digitally enabled and expedited on a path for sustainable living.

Imagine a *Digital City* where free WiFi and open data access fuels new startups – enabling residents to create networks and design solutions addressing community problems.

Imagine a Caring City where non-profit organizations in the community are connected to provincial and municipal data infrastructure to influence policy development and drive evidence-based decision-making to improve the lives of residents.

Our Smart Community Vision

Fredericton & St. Mary's First Nation are collaborating to create an accessible, welcoming, supportive community, starting with youth, newcomers, older adults, and persons with mobility-related disabilities; recognizing what is important to individuals and connecting them to what matters most, empowering residents with personalized digital tools, data & technology that enable them to create an exceptional quality of life.

A Look Back at Our Smart Cities Journey

When the Smart Cities Challenge was first issued in November 2017, **Fredericton set out to determine through wide-ranging engagement what the biggest challenge facing our community was and how we could solve it using data and technology.** Through an extensive engagement process, we received hundreds of responses from the public through surveys (online and in paper copy), with a game app, using social media and emails to networks of community stakeholders.

What we found was that people had an incredible wide range of issues and solutions in mind. While we found **the biggest issue facing the community is different for each person,**

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the commonality is that everyone has desires and needs that could be better met. People expressed a desire for the City to better understand the needs of residents through improved data and targeted services to individuals based on their needs.

We saw a unique and historic opportunity for St. Mary's First Nation and Fredericton to partner together in this ambitious and important endeavour. Both communities remain committed to work together to develop innovative solutions to issues we share as well as the issues that are unique to our communities. We consider this the launching point for a future Friendship Accord.

We collaborated and consulted deeply with the community to create our application and our proposal through our Smart City Task Force and its committees. More than 40 people from 20+ organizations have been directly involved during the finalist phase in creating this proposal and moving forward its key initiatives, with additional stakeholders being engaged through individual projects. Residents have also been directly involved in the design and creation of the solutions proposed through the use of deep one-on-one conversations and observation, online survey responses, user-centred design workshops and focus groups, and testing the prototypes. (See *Engagement* for more detail.)

Before we entered the Smart Cities Challenge, we held a number of broader community engagement efforts that, together with the engagement efforts we undertook in the application and finalist phases, have helped inform our proposal:

- **Imagine Fredericton** – involving 2,800 people over 85 days to articulate the vision for the City as it grows, including the importance of being a welcoming and supportive community.
- **Digital Fredericton** – engaging more than 120 staff from across the City of Fredericton at every level on how the City can improve operations for better service.
- **Partnering for Impact** – 72 people from 30+ non-profit organizations coming together, identifying that to collaborate on shared concerns, there is a need to enable data collection, collaboration and measurement in the non-profit sector.
- **Age-Friendly Survey** – more than 900 older adult survey respondents identifying what they like about the community and what could be improved to make it more welcoming and safer for older adults.
- **Open Space Forum on Homelessness** – involving 40+ faith-based groups, highlighting the need to better coordinate efforts of these groups for those experiencing poverty and/or homelessness.
- **The Road Home: A Plan to End Homelessness** – consulting more than 130 community stakeholders including frontline workers at homeless serving agencies and people who have lived experience with homelessness, identifying that shared data management is a key feature to better serving people who experience homelessness in the community.

One of the key insights we had in the lead up to our original application was that we could not be a smart community if we left behind the people that are most likely to be under-engaged – those who often experience vulnerability, marginalization or exclusion. We decided that a smart community respects, values and facilitates the contributions and talents of all residents and accepts and embraces our diversity.

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We created our challenge statement to focus on community collaboration welcoming, supportive and accessible community for all by recognizing and people to what matters most to them. We set a bold aspiration in our applic primary outcome we wanted to achieve – to identify citizens' unique needs, c to personalized services and resources that meet those needs using enhance and to develop new collaborations and partnerships to achieve it.

Connecting culturally is important for a sense of inclusion and belonging. For F language and culture are core to identity; reconnecting with customs and la important in restoring a personal sense of inclusion and rebuilding natio Applying a cultural lens to our digital tools will result in services th sensitive to these needs and direct in address them.

outcome?

> "Our Smart Cities Challenge proposal addresses the issue of belonging. It's so important to foster communities where every citizen has the opportunity to belong; where barriers are broken down so that every person can access the benefits and advantages of their community. Working on this project has brought the community together and generated an awareness, sensitivity and motivation to design tools that enable and promote the inclusion of those who have not been adequately serviced and/or aware of services that exist. Through the Smart Cities Challenge, experts in every field are contributing their knowledge and skills to create a sense of belonging to make our city the best it can be for all its residents."
>
> **Kate Rogers | Executive Director, Fredericton Community Foundation**
> **City Councillor**

What we propose is a fundamental shift away from community leaders and service providers needing to rely on assumptions of what the needs and wants of the community are and how they serve them. This is a necessary shift.

For example, we saw through the Imagine Fredericton exercise in 2016-2017 that the city will change significantly over the next generation, with a likely 50% increase in population by 2041, largely growing through immigration (like the rest of Canada). This will massively increase demand for services. We've also seen over recent years that people expect immediate access to services – government services included – and that people expect services to be maintained, even improved, without necessarily paying more. We must have a continual pulse on who is in our community and be able to adapt to their needs and aspirations. This is also critical in terms of having talent to fuel our local businesses.

Looking Ahead – What We Propose

We will create modern Smart City digital infrastructure that will enable us to recognize who is in our community and what is important to them, connect them to what matters most, and enable collaboration to create a welcoming, accessible, inclusive, supportive community. Our overall guiding approach to achieving this is to:

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- **Understand our resident landscape and define aspirations for the desired experience** to enable the development of prototype solutions for service improvement.
- **[redacted]dernize and integrate core digital infrastructure** and systems to enable more cient and targeted services and increased collaboration.
- **nnect aggregate and de-identified data** from a wide variety of sources to build a tailed community profile/census with richly defined segments and needs.
- **velop more accessible digital tools and connected technologies that are rsonalized and support the inclusion of residents,** enabling people to connect ore to what matters to them in the community.

osal demonstrates the advancement of and continued focus on the initiatives that sed in the original application to recognize and connect people to what matters, including:

- the **Digital Fredericton** transformation initiative
- the **Digital Community Hub**
- Connected Community initiatives (**Doorable, Non-Profit Data Collaboration, and Road Home Digital Platform and Enablement**)

Digital Fredericton

At the **epicenter of our Smart City aspiration** is the need to completely change and modernize how the City operates, serves residents, and collaborates with community. The Digital Fredericton transformation initiative represents a five-year journey to become a more flexible, efficient, responsive, and transparent government that works with community partners and focuses on what matters most to residents. This means a focus on delivering experiences to residents instead of services, establishing new collaborative working relationships, and engaging with our community in new and meaningful ways. There are three key layers to make this happen in a structured and integrated way:

- **Layer One: Core Foundation**
  (becoming a more efficient organization to better serve citizens)
  This is about transforming how the City runs its business with standardized and efficient processes through modernizing systems and IT infrastructures and establishing metrics that matter. As the City gains efficiencies inside the organization, it will reallocate human talent to improve or extend citizen services. Putting these digital core systems in place will provide more accurate and detailed data that will bolster the City's human resources with new insights and data-driven knowledge. It orchestrates an augmented workforce that is both efficient and customer-focused.

- **Layer Two: E-Government**
  (transforming services for citizens)
  This work involves enabling better digital citizen experiences through easy, intuitive access to technology-enabled services that are available 24/7. It's about putting systems in place to better understand and communicate with residents and businesses in real-time to address priorities and needs to make more effective, more resident-centric decisions.

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- **Layer Three: Connected Community**
  (connecting community partners for innovation at the edge)
  This involves working collaboratively with partners in our knowledge ecosystem to continue to enhance services through innovation, becoming a living lab for solutions. It means making data easily accessible, enabling online collaboration and participation from the public and community stakeholders to develop improvements in the community that will help citizens experience life in extraordinary ways.

The transformational work undertaken through Digital Fredericton will make it possible to have both the human and foundational digital infrastructure resources necessary to make possible the other initiatives we feature as part of our Smart Cities Challenge proposal.

Much work has begun with the Core Foundation over the past year, with implementation of key internal systems. To set the stage for the work to be undertaken as part of the implementation phase for this Smart Cities proposal, a Citizen Experience Strategy will be undertaken to define segments and understand the overall aspirations of the customer.

Digital Community Hub

In order to enable new community collaborations, innovation and to get a picture of our community, we propose creating a City of Fredericton and St. Mary's First Nation Digital Community Hub. Currently, information and data about what's available and happening in our communities and the people in them is extremely fragmented and siloed, collected by a wide range of government, academic, non-profit and business sources. How can we connect people to what matters if organizations and individuals don't have a unified, complete, evidence-based picture to understand what is available and where gaps are?

The Digital Community Hub will combine aggregate data from shared data platforms and disparate data systems to create a multi-level hub – creating rich, open data on and for our community, opportunities for unique collaborations on issues that matter to residents, as well as personalized access to what matters most to people. This hub will bring together both existing data and applications as well as new ones developed through the work described in this proposal. The goal is to create a seamless, integrated resident experience, tailored based on the needs and preferences of the individual.

Components of the Digital Community Hub

Smart City Dashboard Allowing for transparent measurement of community performance based on established smart city indicators (e.g. livable community, mobility, safety, environmental stewardship)		**Personal Digital Inclusion** Enabling individuals self-serve and personalized access to resources, tools, people and services they need in the areas that matter most to them	**Resident Contribution** Enabling individuals to voice their need / report an issue and to contribute based on a community need (e.g. volunteer, develop an app, report a problem, add individual perspectives to community issues)

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Connected Community Initiatives

Doorable (Developed by Appdigenous)

People with mobility-related accessibility challenges experience a number of barriers, even when something is purportedly designed for them. The existing "push buttons" on accessibility doors are often blocked, not functioning, awkwardly placed, or simply not easily used by people who have limited mobility in their arms and hands.

Doorable, developed by early-stage startup Appdigenous, is an Internet of Things solution featuring a multi-functional mobile app & custom designed hardware. It will help reduce barriers by wirelessly opening doors through a smartphone/tablet app. It will further help in identifying and reducing accessibility barriers by mapping the accessible city, creating a platform for app users to communicate directly with each other and facilities about accessibility barriers, and building data through interactions between citizens and infrastructure. The technology will integrate with the Digital Community Hub to help offer more robust information and data around accessibility and related challenges in our community. This project would make Fredericton and St. Mary's First Nation an early adopter test bed for the technology and a product development living lab for accessibility in Canada. Testing has already begun and is revealing insights on how the physical shape of our cities can profoundly hinder or enhance full participation in civic life. Appdigenous has, as part of this process, already developed concrete plans to expand into communities across the province and country with this next generation technology.

Non-Profit Data Collaboration

Many non-profit organizations (NPOs) lack expertise in data-driven outcome evaluation and measurement and miss out on the benefit of using data to best inform the decisions and policies they make. Government departments across Canada do not have robust access to data related to the frontline services of non-profits, which is a huge gap in information for policy development. NPOs want to go beyond siloed agency-specific data and be able to compare and link their data to other open data sources to gain a more holistic understanding of the impact of the services they provide on community.

Through this project, we will build the NPO community's capacity to collect data, establish measures and integrate with other public data. It will involve working with NPOs on establishing meaningful measurements, standardizing how to collect data, and how to link it with other data that is available to be able to measure efficiency and impact, improve access to funding, identify gaps and improve services. This project will allow agencies to collaborate and access data at a community level through the Digital Community Hub in cause-based hubs. Secondly, through the New Brunswick Institute of Research, Data and Training (NB-IRDT), one of the most secure data centres in Canada, it will allow government, non-profits, and researchers to secure aggregate/anonymous data on the impact of their services which can be cross-referenced with community demographics. You can see more about the process of how data is shared through NB-IRDT in this video:

https://www.youtube.com/watch?v=vUrkCUyFunM

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Road Home Digital Platform & Digital Enablement

Our homeless serving agencies are continually dealing with resource constraints to help their clients move along the continuum of care to achieve stable housing. These agencies lack the technology most organizations take for granted to operate efficiently and effectively. Clients often have to tell their story multiple times when they present themselves at homeless serving agencies that can and do work together to help them.

Adopting a shared digital platform through HIFIS4 (the latest version of the federal government's Homeless Individuals and Families Information System) will allow for shared case management and provide agencies with quick, accurate information to help better support clients, securely capture aggregate data, and generate useful reports to track performance and needs at an agency and community level. The plan is to expand HIFIS4 across the homeless-serving system to enable a coordinated approach to serving clients. For individuals, this system will reduce the need for them to re-tell their story to multiple service providers and help them connect to services along the continuum of care more effectively. To further enable this connection, we're also proposing to expand access to free, high-speed Internet in the shelters and in public places, as well as enhance and design new self-serve digital personalized inclusion resources for this segment as part of the Digital Community Hub.

Ongoing Development of Connected Community Applications

There are many more solutions that our focused iterative model will produce and refine. Connected Community applications will be based on the insights we gain from understanding residents more deeply and developing solutions to help recognize and connect them with what matters personally.

Through the finalist phase, we continued to uncover new opportunities using the model of dialogue with a segment to learn about the needs of people in that segment and then involving them in user-centred design to co-create a prototype. In one example, we partnered with a local startup to prototype an app for newcomers to connect them with a personalized tool designed to help facilitate their inclusion.

Our vision includes ongoing mutual learning about the data and technology opportunities within First Nations. This proposal recognizes Indigenous rights to self-determination. Under Indigenous control and directed by staff hired from Saint Mary's First Nation, the team will develop technologies and applications that match the aspirations of Indigenous people and are culturally sensitive to First Nations' needs.

Smart City Internet of Things (IoT) Telemetry

- Resident experiences can be personalized in real-time with data about the status of services that impact them.

Cities deliver many common services to residents using infrastructure, public spaces and assets that are spread across a large geographic area. Telemetry is an automated communications process by which measurements and data about infrastructure and public

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services are collected at remote geographic or inaccessible points and transmitted to equipment for monitoring.

[redacted]

can be optimized and personalized using real-time and historical data. Real-time ut the availability of a parking space, the status of a transit bus, the current river ring a flood, soil condition at sports fields after rain, air quality, noise level, current aring and garbage routes and road conditions will be pushed from our LoRaWAN ork to our open data portal and accessible through application program interfaces r consumption by Connected Community applications, third party developers, and ity operations.

Our Repeatable Community Model

With the Digital Fredericton transformation initiative and Digital Community Hub providing the foundation, we have developed a repeatable community model to recognize and connect residents with what matters to create an accessible, welcoming and supportive community through the use of personalized digital tools and data, achieving the transformation we envision. First, to get an overall picture, we will undertake the Citizen Experience Strategy to identify and learn more about resident segments in our community. Once we have the overall experience defined, we will conduct in-depth learning on each segment and develop solutions in response to the unique needs and aspirations of residents. Below is an outline of the process (see *Engagement* for more details).

- We will **deeply get to know each segment** (beginning with those who are most likely to have experienced marginalization or exclusion) **and their experiences through direct interaction** using ethnography. Ethnography means having deep one-on-one conversations and interactions with people to understand day-to-day experiences of residents, what's important to them, and what barriers/challenges prevent them from having a great day in the community. We will supplement this approach with engagement through the resident contribution feature on the Digital Community Hub to confirm insights and offer broader opportunities for people to identify barriers they face to their quality of life.
- Based on the research, we will use **journey and empathy mapping** to develop insights about what matters to people in that segment. We also use the research to develop distinct "personas" within the segment (a resident profile that brings together specific types of similar experiences and behaviours within a segment).
- We will then engage and connect with community partners (e.g. NPOs, entrepreneurs, tech businesses, etc.) to **ideate potential solutions** based on the insights using connected data and technology.
- We will **co-design the solutions with residents** from the segment and work with community partners to **develop prototypes** of personalized digital tools, data and technology using user-centred design workshops.
- We will bring the applications and data from the developed tools and technology into the **Digital Community Hub**, which will feed back into the cycle by further giving us insight into the challenges and aspirations of our community. This will contribute to the

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metrics that enable better policy and decision making and offer richer, personalized information tailored to each individual's unique set of needs and preferences.

This model isn't a straight line – it's an iterative cycle. We will continually go through the process of taking what we learn from each segment through the engagement, ideate on solutions, prototype, test and build more data and insights to improve on those ideas and develop new ones.

Outcomes

Through the initiatives we propose, we will achieve our **primary outcome** of identifying residents' unique needs and connecting them to personalized services and resources that meet those needs using enhanced data tools. We will do that through the following key related outcomes (see more detail in *Performance Measurement*).

- Improve the quality of life by making it easier for citizens to access all services provided by the City and for the City to push out information that is meaningful to citizens.
- Use customer relationship management (CRM) systems and move more staff to customer-facing roles to create a more personal, welcoming city, enabled by efficient, technology-driven processes.
- Create a multi-level hub to create a channel for interactive government, personalized access to services and activities available in the community, and a place where the community can collaborate on key quality of life issues, bringing together both traditional & non-traditional partners to deliver on common objectives.
- Increased economic vitality and job creation through the development of new technologies resulting in the creation of new startups and new opportunities for existing businesses, as well as increased participation of underrepresented groups in the job market due to increased accessibility and connection to needed supports.
- Recognizing that language and culture is identity and the importance of these for Indigenous people, enable an Indigenous cultural resurgence through digital technologies that youth and elders can use to connect with their language and heritage.

> "Indigenous community members of all ages use digital technologies – in particular social media. A holistic approach to digital technology can support Indigenous language and cultural resurgence."
>
> **David Perley | Director of the Mi'kmaq-Wolastoqey Centre**

> "Language is identity. It's the foundation. This is the International Year of Indigenous Languages. We have a prime opportunity to remove barriers to learning our language."
>
> **Chief Alan Polchies Jr. | St. Mary's First Nation**

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- Empower the City's non-profit agencies to make data-based decisions that will help them to better serve their clients and our community and be able to contribute to the community-level data.

> "Shared data within and from the non-profit community will enable a full conversation with all social sector stakeholders who are working with the most vulnerable members of our community day-in, day-out. The greatest benefit of this project will be how shared data enables government, business, and community partners to collaborate on the solutions to the most pressing problems facing our community. As a community, we are striving to achieve bold targets to address deeply entrenched social issues; without shared data, we cannot really know if our efforts are amounting to the change we desire, or why they may not be working. You can't manage what you don't measure. Data and results are essential in making sound social and public policy decisions, and so often we are limited to making important decisions based on hunches or anecdotes."
>
> **Jeff Richardson | Executive Director, United Way**

- Enable a more accurate assessment of the housing and support needs of people experiencing homelessness in our community and reduce their need to tell their story multiple times through enabling shared case management and resource allocation between homeless-serving agencies.

- Making the physical infrastructure of the city more accessible, and movement through the public space more fluid, making it easier for people with mobility-related accessibility challenges to live and get around their community with fewer barriers.

> "AbilityNB applauds the leadership of the City in seeking solutions to accessibility challenges with our City to ensure everyone can live work and play in our community. Universally designed communities and programs are essential so all residents of a community can actively participate. More than 73,000 New Brunswickers live with a mobility disability – the most common disability type in NB. At 26.7% of the population, New Brunswick has the second highest rate of disability in Canada. A disability lens on policy, infrastructure and program development is critical."
>
> **Haley Flaro | Executive Director, Ability NB**

Progress Towards Outcomes During Finalist Phase

During the finalist phase, we focused on further developing this final proposal while also making significant progress towards these outcomes and testing our approach. Over six months, we put systems in place and tested out the ideas and concepts we're proposing, conducted research on some of our priority segments and accelerated the development of key prototypes of solutions for them.

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Building core foundation	• Engaging more than 120 City staff to select, test and configure technology tools to assist in streamlining business operations. Modernizing our approach to internal systems has driven results for staff and gained efficiencies that are being re-invested in delivering value to citizens. • Built most of the City of Fredericton's core digital foundation through implementing an enterprise resource planning cloud solution (Canada's first cloud-based municipal core), enabling staff with modern technology and corporate standard processes to be more efficient in their operations. • Freeing up staff capacity and reallocating staff toward customer-facing roles to improve services for citizens.
Uncovering insights on resident aspirations & challenges	• Focusing on three of the priority segments – older adults, people experiencing accessibility challenges, and newcomers: o One-on-one conversations with older adults to uncover insights that removed assumptions and highlighted opportunities to help older adults in our community. o Co-design workshops with older adults and persons with mobility-related accessibility challenges for the Digital Community Hub. o Conducting a day-in-the life tour with a person in a wheelchair to understand challenges. o Broader online survey to uncover more about the barriers people with mobility-related accessibility challenges face with entering buildings and getting around the community. o Conducting a co-design workshop and journey mapping with newcomers of diverse backgrounds. • Conducting an environmental scan of NPO best practices of data privacy, use and collaboration.
Stakeholder relationship/ partnership development	• Developing relationships and in-kind and other partnerships (see *Governance*). • Building stronger relationships with other municipal governments and levels of government to ensure a repeatable model is designed for resident-centric communities. • Onboarding 11 non-profits for the Non-Profit Data Collaboration, mapping out their current data collection, use and disclosure practices and privacy standards and delivering education on the benefits of data collaboration with other non-profits through a video and workshop. • Onboarding 5 homeless-serving agencies for Road Home Digital Platform & Enablement, identifying the most meaningful outcomes achievable through digital enablement to help better serve those who experience homelessness and begin data transfer to HIFIS4 (shared digital platform). • Engaging with the Mi'kmaq-Wolastoqey Centre to uncover potential ways to support Indigenous resurgence with digital technologies. • Engaging with Mayor, Chief, City Council & Band Council on progress and goals of proposal.
Data and Privacy	• Completing comprehensive preliminary privacy impact assessment (PPIA). • Mapping out data flow for projects.

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	• Conducting extensive workshops with project leads, led by a privacy expert with more than 25 years of experience to create a detailed plan with clear principles to ensure all projects comply with legislation and meet the standards of Privacy by Design and the 10 Canadian Standards Association (CSA) Privacy Principles.
Ideating and Prototyping	• Running an ideation workshop to generate and prioritize ideas for prototypes based on insights gained from older adult ethnographic research. • Rapidly prototyping a check-in companion app (developed by a local startup) that can be used by older adults so they feel connected and safer in our community. • Running the two co-design workshops with individuals that identified as older adults and persons with mobility-related accessibility challenges to identify the best design for the Digital Community Hub prototype. • Creating a prototype of the Hub with a focus on mobility, accessibility, and older adults. • Accelerating the development of the Doorable hardware and first version of app software. • Developed Hullo app MVP (minimum viable product) for newcomers to connect with settlement organizations.
Testing Prototypes	• Usability testing of Digital Community Hub, Hullo App, Companion Check-In, and Doorable (see *Engagement*)

Why This is a Winning Proposal

Our proposal thoroughly embodies a smart cities approach. We will bring together diverse sources of data to break down silos between government, organizations and residents so that we can address issues of importance to the community in a holistic way, with a complete picture of what matters and a more accurate measure of our performance in addressing the needs of our residents. It's about coming together as a community, bringing together partners and stakeholders – from the City and St. Mary's First Nation, to businesses, non-profit organizations, academia, and individuals – to collaborate in creating a more welcoming, accessible and supportive community. First by getting a more accurate and deep assessment of what the experiences, aspirations and challenges of our residents are, then developing innovative approaches to improve services and break down barriers to inclusion and full participation for all.

We have developed a unique approach to understand and better serve residents:

- using ethnography and a continuous dialogue with residents to gain a deep and ongoing understanding of our residents, their aspirations and challenges
- interconnecting data from a wide variety of disparate sources to build a complete community profile and enable effective analysis & insight-driven decision-making to make services more effective for residents
- intensely collaborating with community partners from all sectors
- involving residents directly in the design of solutions using human-centred design

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- enabling a more personalized experience for each resident, tailoring services, information and tools to their unique needs and preferences

We have the momentum to make this proposal a success. The initiatives that we propose build on work that has been ongoing in the community. We have made further significant progress during the finalist phase – creating several prototypes in addition to creating this final proposal. **We have demonstrated our ability to make significant progress in a short amount of time and to make investment dollars go far.**

We have a demonstrated ability to build and implement smart solutions that will be a model for the country. As part of the Digital Fredericton transformation, the City of Fredericton has launched Canada's first cloud-hosted enterprise resource planning solution for a municipality, which was implemented using agile development in just eight months and was completed on time and within budget.

Other initiatives we are undertaking further demonstrate how we are able to lead the country in building smart communities. The Non-Profit Data Collaboration project is a game-changer, as it is the first time that NPOs are working together to collect and bring together data on their services on this scale, connecting them with provincial and municipal data infrastructure.

The Connected Community apps developed through the implementation of this proposal, such as Doorable, will be developed with the view of being adoptable by other communities across the country. We're also building technology that is enabling a likely unprecedented amount of collaboration among community partners of all types, as well as an ongoing dialogue with citizens.

The initiatives in this proposal will not only lead to an improvement in the quality of life for Fredericton and St. Mary's First Nation; the transformative solutions we develop will also be able to benefit communities of all sizes across the country. Any community will be able to replicate our approach to recognizing and connecting residents to what matters and building personalized digital tools that respond to their community needs.

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Engagement

Engagement is the Cornerstone of Our Proposal

Traditional community engagement includes broadcasting information (through news releases, web and social media updates), public meetings and open-houses, online surveys, stakeholder meetings and emails, sometimes more unique activities like an "ideation bus", etc. These methods of engagement are useful, but there are ways to more deeply and meaningfully engage with residents.

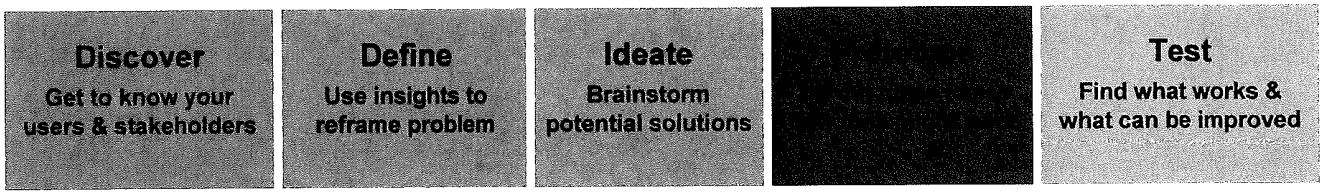
The initiatives and projects that are part of this proposal will offer ways for the City of Fredericton and St. Mary's First Nation, as well as other organizations within our communities, to engage with approaches and tools that put our residents at the center and allows for better understanding of their needs, desires and challenges. Residents will have an improved ability to voice their needs and contribute back to our community.

We are also deeply involving residents and stakeholders in the design of these solutions that we will use to be able to engage and better understand residents and connect them to services and resources that meet their unique needs.

Using Human-Centred Design

We're using human-centred design (or user-centred design) to involve the people we are designing for and facilitating citizen co-creation throughout our Smart Cities projects – from concept to design, implementation, and evaluation. This will ensure that the solutions are tailored and adjusted along the way to meet their needs and achieve meaningful outcomes.

Human-centred design informs better decision making by understanding not only what works or doesn't work, but also why. It allows us to more deeply understand the pain points and ambitions of the community's residents to be able to build the most effective and appropriate solutions to connect them with what matters. Here are the elements of the human-centred design process we're using:



Source: Jules Maitland, Human Centred R&D

The process doesn't end with testing the solution – there's a continuous loop as we brainstorm solutions for improvements based on feedback we get in the testing phase, prototype those improvements, and test them again with people. It's an iterative and ongoing cycle within a living lab environment.

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Discovering Who Our Residents Are, Defining Aspirations & Challenges

It's easy to get lost in demographics and data. We want to go beyond the data to gain a more holistic understanding of our residents.

Ethnography is the primary method we will use to understand what residents want in terms of their experience in the community and the barriers and challenges that might prevent them from achieving that experience. Ethnography involves interacting with and observing people directly through one-on-one interviews and other interaction and observation in places where the person spends their time.

It leads to uncovering much better information about people's motivations and aspirations than self-reported information through a survey. We get a better understanding of how residents think, what they see, how they feel, what they hope for, what they fear, what goes well in their day, and where their pain points are. We can then map those insights using empathy and journey mapping to gain an understanding of what the end-to-end experience is for the resident.



Example of empathy mapping (Source: GNB Silobusters)

A foundational piece of the work through Digital Fredericton is the Citizen Experience Strategy. We will use ethnography, which we piloted during the finalist phase, to gain deep learning of different segments of the population in both the Fredericton and St. Mary's First Nation communities. As part of the ethnographic process for each segment, we will:

- ***Have in-depth one-on-one conversations/interviews with residents, representing a wide range of segments.*** The hour-long conversations occur at the participant's home or other familiar place.
- ***Do "walkabouts"/"day-in-the-life tours"*** with 1-2 participants in each segment in order to observe and learn more about the challenges identified in interviews.
- Use ***empathy and journey mapping*** to be able to visualize where the high and low points of the resident's experience is and map out the moments that matter.
- Based on the information uncovered as part of these exercises, ***develop distinct empathy-based personas*** within each segment and document their current experience, aspirations and pain points.
- To test our findings, we will supplement ethnography with broader traditional engagement tools.
- Document the "moments that matter", we will analyze our efforts to ***develop new and unique insights*** to understand the future experience desired by residents to be able

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to both ideate and prototype segment-specific solutions and make overall improvements to common, digital infrastructure used by all residents.

This process is a very effective way to test and challenge existing assumptions and uncover new and unique insights.

Piloting our "Discover and Design" Approach

During the finalist phase, we piloted these engagement methods to test their effectiveness and suitability in our Smart Cities operating model. It proved to be very effective in discovering more about specific resident segments and define the unique challenges they face. During the pilot activities many existing assumptions were tested and broken. This collection of field research ultimately leads to real evidence-based decision making.

As a **very early pilot of the ethnography**, and to secure long-term support for this method, nearly all the City of Fredericton's senior leadership participated in a workshop exercise – interviewing citizens from different customer segments, developing personas, mapping out what a typical day looks like for that persona, and identifying the key challenges that persona faces. They then designed concepts that might help solve some of the challenges. As a result of this engagement, the senior leadership of the City is energized by this approach because the level of engagement is much deeper than normal methods of public engagement and resulted in new insights that would have previously not been considered in service delivery, public policies and setting government priorities.

We then did a **full pilot for one segment, conducting ethnographic interviews with 13 older adults**. As a result of hour-long, in-depth conversations, we got a clear sense of what the participants' current experience is, what the "moments that matter" are in their day, what challenges they face and what they would like to see improved to make their experience in Fredericton a better one. We used the information to develop three distinct personas based on analysis of the information.

We piloted a **"day-in-the-life-tour"** as part of the work to uncover challenges for another key segment – persons with mobility-related accessibility challenges. Appdigenous Founder and CEO Melissa Lunney accompanied Zack, a young man who uses a wheelchair, as he went around the City. We filmed the experience and attached a Go-Pro camera to Zack's wheelchair to gain perspective of a person with accessibility challenges and experience a day in their life as a tool to develop insights. Through his interactions with people and the environment and conversation with Melissa, Zach revealed several accessibility barriers he faces in Fredericton.



Appdigenous Founder and CEO Melissa Lunney accompanies Zach on a day-in-the-life tour.

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As part of the finalist phase, we also conducted a **market research survey** fo
The survey was largely distributed online through the City of Fredericton's so
Ability NB's (the provincial organization for persons with accessibility challen
media and email list, and physical copies at the Stan Cassidy Centre for R
(where the link to fill the survey out online was also promoted).

Tech already selected - engagement after

More than 100 New Brunswickers who identified as having an accessibility cha
a few cases, caretakers for people who have an accessibility challenge) filled ou
57 of respondents reported living in Fredericton and the remainder from other
in New Brunswick. The data indicates not only receptivity within the City of Fre
also the opportunity to spread the technology elsewhere.

Key Insights Informing Prototypes

Without a network, older adults seek to build their own. Those who live alone, don't have family close by, or are more vulnerable have created their own support networks through friends and neighbours. We found an extraordinary example of this in talking with Sharon (last name held upon request).

Sharon is in her 70s and she and a group of her female friends who live alone in the city use a crossword app on their phones as a way to check in on each other each morning. If one of them hasn't played a word by 9 a.m., the others will arrange for someone to visit their house to make sure their friend is okay. One of the friends didn't play her word. When they went to check on her, they found she had fallen into a diabetic coma. They called 911 and emergency responders saved her life. Without connection to this network, this woman would not be alive today. But not everyone has access to these networks. Social isolation is a real demonstrated issue across the country that needs to be addressed.

Volunteering is limited by mobility. When older adults are unable to drive, their participation in volunteering decreases. Older adults are actively looking for ways to give back their time and energy in Fredericton, but are prohibited by limitations in their mobility.

Accessibility challenges prevent people from participating in the community. 88% of people with accessibility challenges that responded to the Doorable survey found that lack of accessibility prevented them from going to public places that they'd like to/need to go (83% for Fredericton). Respondents reported that buttons or accessible doors themselves are often broken and that the buttons too hard to push (whether due to an issue with the button itself or the user's limited strength) or were in an awkward location or height.

77% of respondents felt that a solution that would open "push button" accessibility doors from a smart phone or table would or might make a difference whether they would enter a building (83% of Fredericton). Respondents also overwhelmingly valued a platform to communicate about accessibility barriers (87% for all respondents; 84% Fredericton only),

> "I think that [Doorable] is an excellent idea because I am in a wheelchair and I find it hard to go places when there is no one with me. I can't use my arms, so I am not able

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[redacted]ch the button. Also, often times the button are in places that no one in a chair could reach unless they have full mobility in their arms. [...] I am very ed, and I think this is something that would be great and that people with lities would benefit from. [...] I would really like for this new invention to come to that people with disabilities can live independently and don't have to rely on one to open the door every time they want to go somewhere."

Erica (last name held upon request)

Use of technology is more common among certain segments than we might think. We came up against an assumption during the finalist phase that perhaps technology use is not common among the segments we focused on in our finalist phase due to either unfamiliarity or unaffordability. We found that assumption was flawed.

The ethnographic interviews revealed that email, Facebook, and Skype, among other online applications are all commonly used by older adults. Although technology literacy may not be the barrier, affordability can be. Those with financial limitations tend to rely on public access or choose to live without it entirely. This creates a level of unfamiliarity not from being disinterested in technology but rather out of circumstance. In a similar vein, conversations with homeless serving agencies have revealed that many people experiencing homelessness do have a smartphone – either their own or through sharing one with another person, but with limited means, they generally can't afford a regular phone or data plan, so they rely on free WiFi to use them. Early indicators are smartphone and tablet use is widespread among people with mobility-related accessibility challenges – nearly every respondent in the survey noting that they use one or the other.

This shows how effective this approach can be in challenging and confirming or debunking assumptions.

Living Lab – Ideating, Prototyping & Testing Solutions

Co-creating with community to develop tailored digital solutions for residents

With much clearer insights on the aspirations and challenges our residents face, we will continue our Citizen Experience Strategy work that will be undertaken early in the implementation phase, sharing the findings and **partnering with entrepreneurs, residents and community organizations** to brainstorm ideas/solutions to address problems, and create prototypes of those solutions to test them with residents they are designed to help.

- We will conduct ***brainstorming/ideation sessions*** with frontline staff and managers from the City of Fredericton and St. Mary's First Nation, entrepreneurs from the local technology community, as well as NPOs that provide frontline services to the residents in the segment we're designing for. We will tap into their creativity to ***generate exploratory concepts guided by the resident insights*** for data and connected technology solutions that will solve a specific issue for each of the resident personas to help them achieve their ambitions and overcome the barriers they identified. The ideas will be prioritized for implementation by the participants in the session based on feasibility and impact.

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- As part of our Digital Fredericton Connected Community layer, we will work with businesses/startups and others to create prototype solutions using ***rapid prototyping & co-design workshops*** to see how ideas might work. Prototypes could include creating mock-ups and wireframes or a small minimally functioning product to be able to better show the capability.

- We will continue to directly involve residents in the design of solutions through ***co-design workshops,*** involving them in the prioritization of features and what should be included in the design.

- Once a concept has been prototyped, we will move to ***testing and refining solutions***. We will hold usability testing with residents, finding out what works and what doesn't about the product so the design can be iterated and improved upon. Based on the feedback received, the idea will be refined and launched to the public. The community will continue to act as a living lab for new technologies and solutions.

- In the design and testing stages, we will also ***engage with accessibility and other experts*** that work with the people we're designing for (e.g. people with expertise in accessibility standards) to ensure we design with diversity and inclusion in mind, taking into account how certain population groups may have different abilities to access, use the technology, and benefit from the solutions we design.

Piloting our Approach for Ideating, Prototyping and Testing

Over the course of the finalist phase, we have piloted the core elements of this approach. After the "discover and define" efforts we piloted with older adults and persons with accessibility challenges, we worked with community partners to ideate, prototype and test new digital solutions to the challenges and ambitions identified and refined the Community Digital Hub to personalize it for the target segments. At the end of the finalist phase, the solutions are at various stages of design, development and idea testing.

The progress completed in the development of this proposal demonstrates our Smart Cities Model in action: connecting people to what matters most to them, creating an assessible welcoming community, and taking strides towards personalized digital inclusion.

Doorable for Improving Accessibility

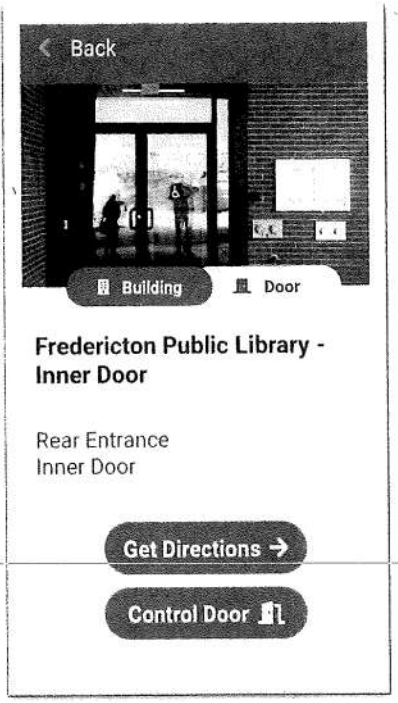
Over the finalist period, Doorable has moved from concept to early stage production. Hardware was developed and installed in test sites and more advanced user-centred design was used to build the software application. These were field tested with the target audience.

Appdigenous created prototype hardware and a plan for prioritized features based on the challenges and other insights identified by people with mobility-related accessibility challenges in the design and discover stages. Guided by human-centred design principles, usability testing was conducted with the participation of a person who uses both a wheelchair and a walker to inform the most intuitive and useful app development.

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During this phase, consultations were also held with Stan Cassidy Centre for Rehabilitation occupational therapists specializing in assistive technology and an assistive technology specialist from CNIB (Canadian National Institute for the Blind) to identify ways to make the technology most accessible and inclusive. Consultations are also being undertaken with owners-operators of public spaces to understand their needs as secondary users of the technology.

[redacted] the insights gained during this phase, a first version ıp was developed. Hardware was deployed at six (including City Hall, Fredericton Public Library, ı and Productivity Council, Brookside Mall, Grant :entre and Willie O'Ree Centre). As of February, the ɣy is being tested in-the-field with a group of users ɛ mobility-related accessibility challenges and those :ialized knowledge associated with the technology or own buildings. Already, the app is available publicly load in Google Play and Apple's App Store.



Screenshot of Doorable app

Companion Check-In App for Older Adults

The ethnographic research revealed that one of the personas of older adults include individuals who live alone, have no family in the community, and are therefore potentially vulnerable. Without a family network, being able to connect with friends to check in on their wellbeing is important to this group. We also saw that giving back to the community is important to this persona, although their ability to do so through volunteering is hampered by difficulties getting around the city without access to a vehicle of their own. These older adults are very familiar with Facebook.



Screenshot of the Companion Check-in App

We held an ideation session to come up with solutions for some of the insights uncovered. Inspired by the story of the women who check on each other by playing a crossword game app, we came up with the idea of an app that would allow people to interact and check in on friends by playing simple games while also earning points to give back to the non-profit organization of their choice. In just a few weeks, we partnered with a local startup (Mav Synergetic) to rapidly prototype and test a Facebook-based companion check-in app.

The prototype was tested for user feedback with a user-centred design test with an older adult, and a broader market acceptance test using Facebook's demographic and geographic targeting capabilities. Over a period of just four days, 574 older adults in Fredericton (between 3-4% of the city's older adult population) responded to the test promotion and accessed the app. An in-app survey was administered to present the concept of the check-in companion function of the

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app, to which 86% of users responded positively. Two non-profit organizations were also interviewed about the value of the app, one of them specializing in supporting people with intellectual disabilities, noted that the check-in function would be incredibly helpful to many of the people it serves, not just older adults.

The testing confirmed the app's value proposition, with an overwhelmingly positive response in a short time. Primary feedback from the older adult during the user-centred design test was that app seemed to be designed for a much younger demographic and its purpose was unclear. This demonstrates the value the iterative user testing approach. The next step will be working on the app's design to respond to the concerns.

Recognizing that a game may not appeal to everyone, the City developed secor application that tested advanced technology features of voice command and I The prototype supports four types of simple and non-intrusive check-in interfac a simple responsive browser-based web interface, Amazon's Alexa family of d voice command, a simple IoT connected button that is uniquely registered to a s a traditional telephone-based Interactive Voice Response (IVR) system that us The City will conduct further user-testing to get feedback on these new interfac

[redacted]

Hullo App for Newcomers

Newcomers are important to the growth of Canada's communities, including Fredericton. Connecting newcomers to what matters most to them will help them to integrate into their communities more quickly, feel welcomed, and build new lives in our Cities. Ali Allauddin is a newcomer to Fredericton and an entrepreneur. He says, "When I came to Canada, I struggled to find connections that could help me navigate everyday life and I realized there was an opportunity to make it better." Based on his and other newcomers' experiences, Ali came up with the idea of creating an app called Hullo that would help with the inclusion of newcomers in the community.

Using the approach, we have adopted for all our Smart Cities projects, Ali conducted a user-centred design workshop to test two assumptions:

- Newcomers want to integrate and belong to a community with quick access to services, and that an app can help with that.
- Newcomers who first arrive can be, for a time, invisible to the groups and individuals that exist to help them.



Journey mapping with newcomers during a user-centred design workshop.

A minimum viable product of the app was developed to test with users, including a simple sign-in/registration and steps to create a profile, a Google Map integration with language

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preference and chat interface for newcomers to interact with settlement organizations/agencies (such as the Multicultural Association of Fredericton). Further development will allow Hullo to present users with a map filled with local resources, including location-tracked transit and shuttle services, geographically-indexed calendar events, and job postings. Newcomers will be able to be automatically added to their own language and cultural communities upon registration.

Finding meaningful employment opportunities was identified in the user-centr one of the most important aspects of settlement. The MVP prototype is developed with this feature set first.

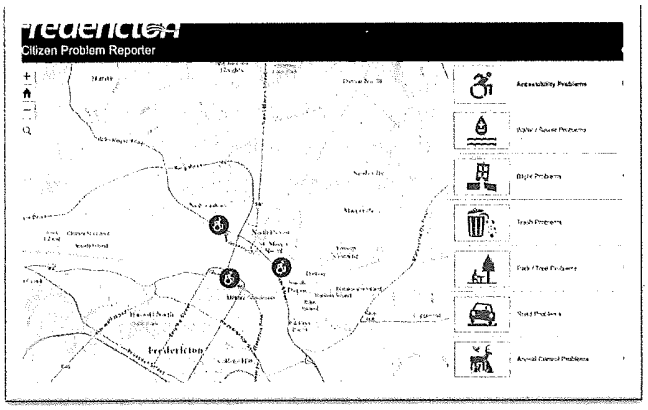
Like the Check-in Companion, Doorable and other Connected Community app Hullo will be connected into the Digital Community Hub.

existing tech, pre-selected prototype

Digital Community Hub

To design the initial prototype of the Digital Community Hub, we held co-design workshops with two segments – older adults and people who have mobility challenges – to find out what information was most important and how they preferred to see it curated for them. We partnered with Esri Canada Limited to build a prototype through which users can access the shared information of our database in an easily accessible and personalized way.

The prototype includes: a Smart City Dashboard feature using existing and prototype data from the City and other sources; segment-specific curated personalized digital inclusion resources (events, information, services) most relevant for older adults, people with mobility-related accessibility challenges and people who are at risk of/experiencing homelessness; and a citizen reporter feature where users can report problems and upvote/comment on problems others have reported, providing a living database of issues in the city. Other key features of the Hub, including cause-based hubs for like-minded organizations to collaborate on issues of common interest will be developed in the implementation phase.



Screenshot of the Citizen Reporter feature of the Digital Community Hub prototype.

GIS mapping is embedded in most of the features so users can easily see where resources and where issues are reported. Users can create a personalized profile, in order to earmark the information most relevant to them and to follow progress on issues / items of interest (e.g. if they report a problem, they can receive a notification when it's been addressed).

To see results of the ethnography, the prototypes completed, the user-centred workshops and our video content, along with links to downloadable prototype applications, please visit www.fredericton.ca/smartcity.

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Stakeholder Partnership and Collaboration

One of the key opportunities of this proposal has been our stakeholder collaboration. From the very start, we've relied heavily and intentionally on working with a broad cross-section of community partners and thought leaders in technical innovation, entrepreneurship and social innovation through our Smart City Task Force. **In addition to the 40+ representatives from more than 20 organizations** that have worked to collaboratively design this proposal, other stakeholders have been and will continue to be engaged through the projects. Ongoing stakeholder engagement includes:

- Holding **education/Q&A workshops** for non-profit organizations on the benefits and concerns surrounding data collaboration.
- Engaging **11 early adopter NPOs** for Non-Profit Data Collaboration, beginning with mapping out their current data collection, privacy and use practices and policies (see *Governance* for list of organizations).
- Engaging **five homeless-serving agencies** on their challenges and the benefits of adopting a shared platform. Some of the homeless serving agencies have already begun or completed data transfer to HIFIS4, with plans to bring on other agencies in subsequent years (outreach to the other agencies has already begun)
- Consulting with **owners-operators of public spaces** to better understand how to get the highest participation in installing Doorable technology, including bringing on Brookside Mall as a partner organization. Doorable plans to conduct a research study summer 2019 to determine the number of wheelchair push button doors rand then rolling out the technology starting with public and institutional access, and then private sector.
- Meeting with organizations to **understand the availability of data sets and what's missing to build out the Digital Community Hub** concept.
- Holding **workshops with City of Fredericton staff** at all levels to understand business processes and opportunities to improve, to select the right technology to implement to streamline operations, and to establish the roadmap forward.
- **Briefings** with the Mayor and Council for City of Fredericton and Chief and Council for St. Mary's First Nation on the progress of our Smart Cities Challenge.

We also have and will continue to establish **stakeholder partnerships and use stakeholder networks** to identify participants for and get word out about engagement opportunities.

Additional Insights That Helped Shape the Proposal

Demographics alone are not a good identifier of challenges. In the case of older adults, we discovered factors that affected the challenges they face including whether or not they live alone, their income status (e.g. stable, fixed, limited), their access to a car/transportation, and their state of health. Instead of looking at older adults as one big segment, we're better

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able to contextualize the unique situations and develop a more nuanced understanding of the realities that exist within the segment to identify and address challenges when we break it down on these levels. This shows us the importance of getting to know our residents in a deeper and more comprehensive way through the engagement methods in this proposal.

We need to engage with residents directly to learn how they identify themselves and about their lives instead of making assumptions. There is a perception that older people are lonely and feeble. As we confirmed in the pilot ethnography exercise, "seniors" covers a very large age group, and many people within it live active and independent lives. In fact, we discovered that even if some may use it to describe themselves, the term 'senior' can carry subtle ageism. As one 69-year-old participant said, "I don't like the term senior. I'm an adult, I don't think of myself as anything else."

People enjoy the opportunity to be included in the early stages of design of innovative concepts. Here's what one participant in our older adult co-design workshop had to say about the opportunity to participate in a co-design workshop for Digital Community Hub:

> "It is heartening indeed that seniors are being afforded the opportunity of involvement in a workshop of this nature. I would be most grateful to be included."
>
> **Meris K Brookland**

Engagement Risks and Planned Mitigations

Risk	Mitigation
Not getting a true representation of the community in engagement efforts (not fully reflecting diversity or those that don't traditionally participate in engagement)	• Reaching out widely through community networks for user-centred design efforts, including non-profits that serve those who are often underrepresented in engagement efforts. • Rewarding people for their time (e.g. using grocery cards or other incentives) to reduce the barriers to participation.
Failing to get perspectives of important stakeholders that are tight on resources and failure to communicate benefits of participating	• Minimize off-site training/consultations to save time. • Use regular social media, email updates to share progress, opportunities for feedback, and success stories of how stakeholders benefit from projects.
Confusion/speculation from staff and stakeholders around what's happening, how things will change with the Transformation	• Establish a Transformation Office to coordinate Digital Fredericton effort in a structured way, including integrated stakeholder engagement/change management plan that aligns all projects. • Develop a robust Transformation Hub (e.g. SharePoint site) to host timely and accurate project details for staff and use multiple modes of communication. • Use tools, such as ChangeScout, to identify communications based on change impacts and schedule distribution for targeted messages to end-users based on unique impacts.
Leaders are silent and "invisible"	• Build / refine Sponsorship Cascade to expand the engagement of key leaders across the business.

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Project Management

Road Home Digital Enablement

Scope

This project will build digital infrastructure to support people who are experiencing homelessness and modernize the core systems that homeless serving agencies require to more accurately assess needs and increase service coordination.

- Connect all homeless serving agencies in Fredericton and St. Mary's First Nation with a shared data platform (HIFIS4) (deployment, data transfer to HIFIS4, and staff training for the system and create a consistent triage model).
- Feed de-identified/aggregate data to the Digital Community Hub.
- Deploy free, high-speed internet access at all homeless shelters as well as computers/kiosks for resident use.
- Deploy and upgrade free high-speed internet access in public places in the City center and on transit.
- Enhance and design new self-serve digital personalized inclusion resources as part of the Digital Community Hub.
- Provide first responders with digital resources so they can more effectively help people in the field.

Goals

These activities are designed to reduce barriers for people experiencing homelessness to reconnect / remain connected to community. They will:

- Help homeless serving agencies connect residents with what they need most in a continuum of care more quickly, with a more coordinated approach.
- Reduce the need for individuals to re-tell their story to multiple service providers.
- Allow for more efficient operations for shelter staff.
- Offer a necessary, easily accessible, high-quality internet connection.
- Offer a one-stop for enhanced, relevant online resources for shelter residents and first responders (e.g. places for a free meal, laundry service, crisis support, etc.).
- Take a more proactive, preventative approach in addressing chronic or episodic homelessness and help intercept those at risk.

Project Committee

The committee is comprised of subject matter experts and community stakeholders including: Community Action Group on Homelessness, City of Fredericton, St. Mary's First Nation, Fredericton Homeless Shelters Inc, John Howard Society of Fredericton, Capital Region Mental Health & Addictions, Youth in Transition, and Ignite Fredericton to lead the project.

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Sustainability Beyond Project Lifecyle

At the end of the five-year project, the homeless serving agencies will have a shared client management system and coordinated intake and assessment system to better serve clients. It is anticipated there will be operational efficiencies due to reduced redundancies in the homeless serving system. This time can be reallocated to other priority areas. It is also anticipated that where HIFIS4 is a federal platform, that there will be a renewal agreement between adopters and the government for the sustainability of the system.

Non-Profit Data Collaboration

Scope

This project will connect NPOs with provincial and municipal data infrastructure and will build community capacity to collect data, establish measures and integrate with government and community data.

- Work with NPOs to establish data-sharing agreements.
- Develop consistent data collection standards based on academic research and security/privacy protocols.
- Develop data entry collection tools, templates and DIY data toolkit for NPOs.
- Transfer, de-identify and link data with provincial data infrastructure at NB-IRDT.
- Aggregate and anonymize data to the community level and make it accessible via the Digital Community Hub and provincial open-data portals.
- Run custom analysis of data in-house and in context of community.

Goal / Expected Results

By enabling community-wide engagement in the use of data and improving how our non-profits collect and use data, the project will enable NPOs to more accurately measure efficiency and impact, community needs and recognize gaps and overlaps in service. They will be able to create greater community impact through effective and targeted service design, delivery and evaluation, increased partnerships, and have more outcome-oriented funding in order to more effectively address community problems and influence policy development.

Project Committee

The committee is comprised of subject matter experts and community stakeholders including: Greater Fredericton Social Innovation, City of Fredericton, St. Mary's First Nation, NB-IRDT, NB-Social Policy Research Network, United Way, Fredericton Community Foundation, Fredericton Public Library, Civic Tech and Saint Thomas University to lead the project.

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Sustainability Beyond Project Lifecyle

At the end of the five-year project, the NPOs will have 20% of Fredericton's non-profit agencies with the ability to make data-based decisions that will help them to better serve their clients and our community. Greater Fredericton Social Innovation will continue to support the NPOs in data collaboration and lead post-project activity that maintains growth and development. It will host regular gatherings to develop more advanced uses of data.

Digital Fredericton

Project Scope

The project scope includes work across three areas, which will be informed by the desired citizen experience, as defined by the Citizen Engagement Strategy.

1. **Core operational systems**
   This involves implementing modern cloud applications for **streamlined utility and customer billing, work order management, and field service delivery**, which will:
   - Enable self-serve customer access to billing accounts with real-time balance and transaction information systems to enable a transition to smart meters.
   - Provide a centralized view and point of control for monitoring field service activities to increase productivity and reduce costs.
   - Ensure adequate staffing and on-time arrival of field service personnel and more accurately predict a window for customer service delivery for improved service.
   - Diagnose symptoms and potential resolution for service calls before dispatching field service resources to prevent unnecessary service calls.

2. **Implement core HR/Talent strategies & systems**
   - Develop **a digital talent strategy** to align human resources, recruiting, training and development to this vision.
   - **Automate staff scheduling**, auto-selecting the best employees for the work based on rules, history and future schedule needs, and transforming how the City prioritizes, assigns and delivers work assignments.
   - Modernize **talent and performance management** and make it an ongoing activity through continuous conversations on goals, alignment, frequent checkpoints to review progress, and coaching to enhance performance.

3. **Customer facing strategies & systems**
   - Developing a **comprehensive citizen experience strategy** using ethnography and user-centred design to understand and enable desired resident experiences.
   - Implement **CRM systems for 311 services** to understand customer needs and develop operational strategies & technologies that close the gap between the current service delivery approach and the digital experience desired by residents.
   - Deploy a **self-service citizen portal** that empowers residents to help themselves to services and information, making it more convenient and faster for residents.
   - Create technology interfaces and an innovation lab space to enable the development of **connected community applications.**

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Goals / Expected Results

1. **Operational efficiencies** achieved by streamlining processes and offering self-serve options, freeing up internal staff to focus on more analytical and strategic tasks.

   - Faster and more convenient billing and collections for citizens.
   - Repurpose 50% of account billing work to more relevant citizen-facing roles.
   - Improve customer service delivery.
   - Increase internal operating efficiencies and generate operational savings.

2. A **nimble, agile, innovative workforce** that can apply digital solutions to citizen issues.

   - Clear view of the talent requirements to deliver a new service experience.
   - Engage employees and help them be more strategic and productive in their work.
   - Track resources to increase productivity and improve service delivery to citizens.
   - Efficiencies and cost savings through reduced overtime costs.

3. Provide citizens with **highly personalized, interactive services, access to open data,** and provide the City with **better analytics about what matters to residents**.

   - Convenient and intuitive access to information and services.
   - Better understand and communicate with residents and businesses in real-time.
   - Capturing real-time data to address priorities and needs to make more effective, more resident-centric decisions.
   - Facilitating the environment for potential and existing businesses to innovate through open data access, which will lead to economic development.

Project Committee

The committee is comprised of subject matter experts to lead the digital transformation. Please refer to *Governance* for an organizational approach to project oversight of this area.

Sustainability Beyond Project Lifecycle:

This initiative will generate operational efficiencies, which will be transitioned to sustain ongoing customer service roles and initiatives.

Digital Community Hub

Scope

We will fully build out a multi-level platform that will bring data sets & digital resources from diverse community sources to measure progress on key smart city/quality of life areas, create communities of interest for collaboration on issues, and offer a personalized curation of resources, tools, information and services that matter most to users.

- Establishing data sets to feed into census aspect of the Digital Community Hub and creating process for data identification and refinement.

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- Developing partnerships with organizations to provide data and tools to include on the Hub, and identify alternative ways for people to connect non-digitally.
- Fully developing a platform for each of the Hub levels.
- Developing an opt-in profile for people who want to provide personal info to personalize the information, resources, and services displayed on their Hub.
- Conducting user testing of the platform.
- Creating an engagement survey mechanism to be conducted at regular intervals.
- Monitor our progress towards becoming a Smart City and identify indicators for mobilizing to continue improving the quality of life for all our residents.

Goal / Expected Results

The goal is to give a complete and detailed profile of our community with rich data on who is in our community and their challenges and priorities.

- Increase the sense of citizen inclusion and participation.
- Allow for better informed and proactive decision-making by the City, St. Mary's, organizations, and entrepreneurs, supported by citizens' core needs.
- Improve the ability for citizens and organizations to effect change and have a voice in decisions in their community (participatory democracy).
- Enable open data access so residents and businesses can design solutions to address community problems, which leads to new innovations and economic development.
- Enable more innovative responses to service delivery.

Project Committee

The committee is comprised of subject matter experts and stakeholders including: City of Fredericton, St. Mary's First Nation, WSP Canada, the University of New Brunswick, and the Fredericton Community Foundation to lead the project.

Sustainability Beyond Project Lifecyle

By year five, it is anticipated that the Digital Community Hub platform will be complete and operational. As we generate efficiencies in internal processes, the City will redeploy staff for the sustainability of the Digital Community Hub. As we develop the hub, organizations will have a space to specifically evaluate their direct and indirect impact on our community's well-being. Alternative funding sources will be explored through subscribing partners.

Doorable (Developed By Appdigenous)

Scope

Appdigenous will fully develop hardware and software to make built physical infrastructure more accessible, available free of charge to users (residents). With the wide-spread adoption of Doorable technology that this project will enable, Fredericton and St. Mary's will become Canada's living lab for accessibility.

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- Map the current inventory of push button doors across the City.
- Produce and deploy hardware on doors where there currently is a "push button" throughout Fredericton and St. Mary's First Nation.
- Further develop the core user app to allow users to communicate directly with each other and with facilities about accessibility barriers.
- Develop a next version of existing Doorable hardware (Bluetooth-based), that will enable Doorable to be web-based; significantly enhancing the range of services available through the app.
- Build data through interactions between citizens and infrastructure (e.g. count of door opens, use geo-location features for those that opt-in to specialized research to identify barriers/gaps in accessibility in the community, and help better inform municipal decisions with respect to accessibility).
- Build an application that will assist installers in rolling out the technology in diverse facilities and configurations.
- Build a revenue stream through subscribing facilities, that will allow those facilities to push information on services, programs, events and goods to (opting in) individuals who use Doorable to access their space(s).
- Expand the technology throughout Fredericton and St. Mary's and to other communities in the province and across Canada.

Goal / Expected Results

The goal is to make it easier for people with mobility-related challenges to live and get around their community with improved accessibility, allowing them to be more independent & fully participate in education, jobs, services, the community. This will be done by making it easier for people with accessibility challenges to get into buildings and to access better information about options available to them as well as by giving decision makers better information on gaps in accessibility, so that they can address them. Doorable will also contribute to the Internet of Things ecosystem as a catalyst for other infrastructure changing advances and become Canada's product development living lab for accessibility.

Project Committee

The committee is comprised of subject matter experts and community stakeholders including: private sector lead-Doorable, City of Fredericton, New Brunswick Community College, Stan Cassidy Rehabilitation Centre, St. Mary's First Nation, Research and Productivity Council, AbilityNB, and Hotspot Parking (private sector) to lead the project.

Sustainability Beyond Project Lifecyle:

Appdigenous has developed a commercial business plan for Doorable. The Smart Cities funding will seed the preliminary market testing. With a proven revenue model, Doorable will access investor and government funding to sustain business development.

Budget, Timelines and Milestones

Please see detailed project timelines and budget shown in *Financial* and milestones and progress payments shown in *Performance Measurement.*

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Overall Project Management

Resource Assessment Management Plan

The following criteria will be used to manage the resources, both human and equipment, for project implementation.

Authority/responsibility	• Smart Cities Manager
Timing for resource management	• Monthly meetings
Methods of acquiring resources	• Job posting competition to acquire HR • Secondments of City Staff to this program • Procurement process to acquire materials/services
Training requirements for resources	• Training resources will be engaged as need be based on technical requirements for project implementation.
Tools for managing resources	• Resource performance progress reports • Committee meetings – resource performance • Schedule baseline & cost baseline – resource assignments
Tools for resources measurement	• Resource performance review
Authority/responsibility for accepting resource changes	• Smart Cities Manager • Project Committee Leads

Human Resource Requirements

Resource Role	Timeframe	Responsibilities
Digital Fredericton		
Manager of Corporate Systems Renewal	Existing and ongoing	Leads the Digital Fredericton Transformation, provides visionary leadership on renewal of corporate systems and alignment to the Digital Fredericton Vision. Manages the strategic partnerships and oversee the project implementation, milestones and Digital Fredericton outcomes.
City Subject Matter Experts	Secondments as required	Provides subject matter expertise on City service delivery, and is seconded to agile project teams with technology partners to develop core systems and CRM projects throughout the project lifecycle.
Redeployed internal staff		Staff time gained through efficiencies generated in modernizing core systems will be redeployed to digital customer relationship management.
Digital Community Hub		
Digital Community Hub Coordinator	5 years/ongoing	Developing a structured five-year Digital Community Hub Plan in consultation with the Smart Cities Manager; data discovery and establishing/negotiating data sharing agreements, maintaining data sharing partnerships with organizations; liaising with Digital Fredericton team/St. Mary's ethnographer in terms of receiving ethnography inputs (segments & personas and insights); coordinating user-centred design as it relates to the Hub and feeding this into the design; developing data maintenance/renewal plan and long-term data strategy for future sustainability.
Data Analyst	5 years/ongoing	Modelling data; conducting analyses; liaising with data contacts with partner organizations to obtain aggregate data transfer; inputting data, facilitating the creation of required data; and assisting with data discovery.

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Content Creator	5 years/ongoing	Creating content and assisting with the implementation of the Smart Cities marketing/communications plan includes: advertising/promotions for public engagement; hub/segment releases; social media and website content generation; building the brand, etc. This position also assists with the data entry and supports the overall Fredericton/St. Mary's Smart Cities Program.
Appdigenous		
CEO	Ongoing	Overall business leadership and development.
President	Ongoing	Operational management of Doorable.
Technology lead	Ongoing	Updating of Application(s). Leadership role with outside developers.
Finance Lead	Ongoing	Management of Financial plan, budgets, payroll, billing and costing systems.
CRM	Ongoing	Technical support for users, installers and subscribers, social media promotion.
Installers/Service	Ongoing	To install Doorable hardware on subscribing facilities, capturing information required to populate the User App (maps, etc.). Service existing installs.
6 Researchers	Jun-Aug/19	To undertake the inventory project of all accessible doors in Fredericton and research strategy.
Data Entry Specialist	July 1-Sept/19	To input data from inventory project.
Data Analytics Expert	Sept/19	To analyze data from inventory project.
Research coordinator	May – Oct/19	To coordinate research for inventory project.
Non-Profit Data Collaboration		
Project Manager		Resourced through GFSI.
Process Design Consultant		Resourced through GFSI.
Data Analyst		Resourced through NB-IRDT.
Road Home Digital Platform		
Resourced through participating agencies and in-kind partnerships.		

Smart Cities Program Management		
Smart Cities Manager	5 years/ongoing	• Managing the Digital Community Hub administration. • Liaising with project committees to facilitate the successful implementation of projects. • Managing budget oversight, and funding disbursements to the five projects. • Reporting to Infrastructure Canada. • Coordinating quarterly Fredericton Smart Cities Task Force meetings including report generation (quarterly progress reports, budget, issue management). • Managing strategic marketing and communications for the Smart Cities Program as it relates to Fredericton's brand. This includes the development of an integrated marketing communications plan (encompasses public awareness element/storytelling, leveraging partnerships with respect to marketing, public relations, refreshing GoFred brand, elevating Digital Fredericton brand, etc.). • Cultivating and fostering stakeholder relations/partnerships. • Managing Smart Cities Innovation Lab and liaising with potential and existing entrepreneurs as it relates to Smart Cities app development – connecting them with partners/staff and funding.
First Nations Lead	5 years	• Lead ethnographic research initiatives.

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		• Oversee technology development and implementation. • Advocate and monitor OCAP principles for First Nations data. • Liaison for Digital Community hub and NPO data teams.
Privacy Officer	5 years	• Sub-contract consultants for annual privacy audit
Chief Information Security Officer	5 years	• Sub-contract consultants for quarterly security review and ongoing development of policy and security practices

With the University of New Brunswick and New Brunswick Community College both located in Fredericton and other post-secondary educational institutions, it is assumed that talent acquisition will be viable.

Procurement Management Strategy

The following criteria will be used to manage the procurement components of this project.

Authority/responsibility	• Smart Cities Manager • City Purchasing
Timing for procurement management	• As required as per procurement list pertaining to requisitions
Procurement management approach steps	1. Determine procurement items required (planning) 2. Determine lead time required & timeframe needed 3. Complete procurement documents (as required) 4. Determine & document decision criteria 5. Engage Purchasing 6. Conduct procurements (source vendor) 7. Award & approve contracts 8. Administer & manage contracts 9. Verify & contact deliverables 10. Close contracts 11. Complete procurement evaluations
Procurement documents required	• RFP (Source selection criteria and pricing forms) • Statement of work • Terms & conditions • Non-disclosure agreement • Letter of intent • Firm fixed price contract • Procurement audit form • Procurement performance evaluation form
Tools for managing procurement	• RFP/RFI • Statement of Work (SOW)/Contract • Standard contracts • Purchase Orders • Historical information – vendor performance evaluations
Measurement tools for procurement	• Procurement baseline • Approved SOW/Contract
Contracts approval steps	• Procurements for standard contracts - approved by project management
Authority & responsibility for contract approval	• Smart Cities Manager • City Purchasing (as required for RFPs over certain amount)

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Communications Strategies / Management Plan

A full-scale integrated marketing/communications plan will be developed for the Smart Cities initiative, including approaches to ensure the public and many stakeholders are kept informed on progress and given opportunities to participate in engagement activities. The following criteria will be used to manage the communication for this project.

Authority & responsibility	• Smart Cities Manager • Project Committee Leads
Timing for communications	• Public update on progress every two months • Project Committee meetings • Ad-hoc (as required)
Tools for managing communication	• Quarterly project status reports • Project committee presentations if required • Committee meeting agendas • Project committee meeting minutes
Authority & responsibility for accepting communication changes	• Smart Cities Manager • Project Committee Lead

Stakeholders

See *Governance* section for list of stakeholders and roles/responsibilities.

Risk Management Strategy

The following criteria will be used to manage the risk components for project implementation.

Authority & responsibility	• Smart Cities Manager • Project Committee Leads
Risk management approach steps	1. Do a quarterly risk assessment 2. Identify & capture risk in register 3. Qualify & prioritize risk 4. Determine risk owner, approach and assignment 5. Update risk & action (communicate as required) 6. Close risk in register
Timing for risk management	• Monthly – during project committee meetings • Initiated by change control process (as required)
Tools for risk identification	• Committee meetings • Workshops • Brainstorming • Historical information from similar projects • SWOT analysis • Stakeholder engagement • Corporate risk register • Project risk register
Tools for risk qualification & prioritization	• Risk register criteria (defined below) • Decision trees • Monte Carlo analysis/what if scenario planning
Approach for risk monitoring & control	• Monthly review of open, prioritized risks • Communication of impact of triggered risks (meetings, status reports)

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	• Closing of completed risks
Authority & responsibility for accepting risk plan changes	• Smart Cities Manager • Project Committee Leads

Monitoring, Controlling, and Checkpoints for Project Management

The following framework will be used to monitor and manage the issues of project implementation.

Authority & responsibility	• Smart Cities Manager • Issue owner
Issue management approach steps	1. Identify & capture issue 2. Categorize/prioritize issue (communicate as required) 3. Assign action owner 4. Determine issue resolution plan & due date 5. Close issue (communicate as required)
Timing for issue management	• Monthly - during committee meetings • As required for high priority issues
Tools for issue identification	• Committee meetings • Risk triggers • Escalation to Task Force • Stakeholder interviews
Tools for measurements & management	• Project issues log
Project issue categories	• Technology • Business • Political/Legislative • Resource • Project • Process • Departmental • Security /Privacy

High level summary of project checkpoints and contingency measures will be brought forward in the quarterly progress report to the Task Force.

Project Management Risks and Planned Mitigations

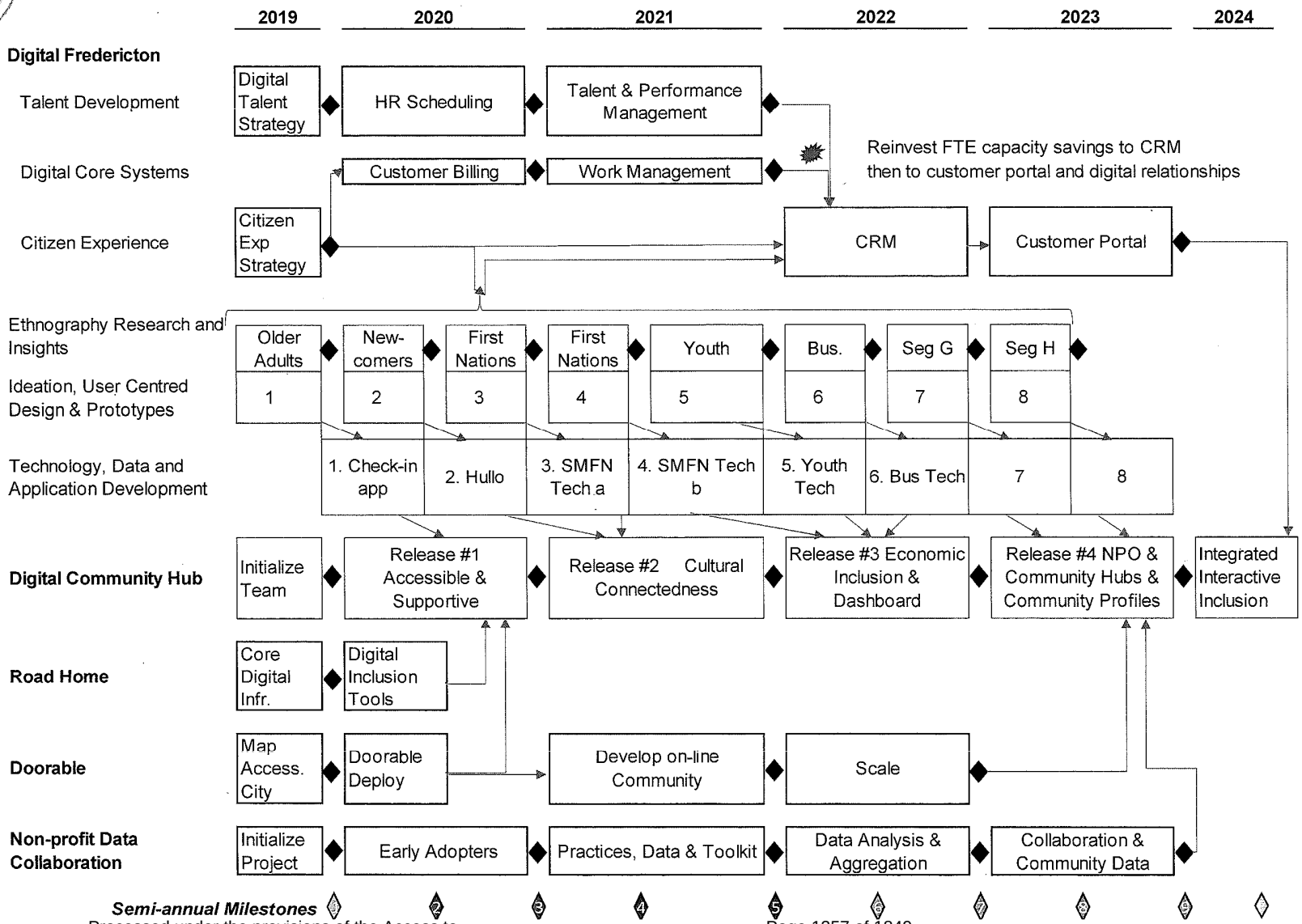
Risk	Mitigation
Risk of building too many one-off Connected Community solutions without the full Customer Experience Strategy and necessary core & talent development systems to be sustainable and efficient (e.g. if an app is built to report a problem to the City, need to connect with automated work management system)	• Build a detailed the citizen experience strategy that outlines the required digital talent strategy and citizen experience and the expected connections to back-end systems in the first six months. • Build core systems in the first 2.5 years of implementation, which will support the sustainability and efficiency of CRM, Customer Portal, and Connected Community apps.
Poor cost management & over-runs	Develop full cost management plan, conduct monthly budget checks for each project to highlight need for adjustments/course corrections as necessary; communicate to Smart Cities Manager monthly.

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Cashflow beyond lifecycle of project	Seek alternative funding sources and revenue generation models (e.g. subscription base, etc.).
Inability to meet milestones	• Strong, organized leadership. • Maintaining well defined scope & project schedule.
Talent acquisition/personnel loss	Good recruitment strategies and relationships with educational institutions, coop programs, summer internships, cross-training, advancement planning.
Lack of operational efficiency/redundancies	Ensure quality plan/process training is in place to ensure projects are completed on time and on budget.
Low morale or change fatigue leading to delays and low-quality work	Kick-off and planned subsequent pulse checks and working sessions to be tailored to equip leaders and team members with knowledge, skills and tools for success in their role on the Transformation and to fuel team effectiveness.
Failure to plan and communicate need for sustained behaviour change /change management support	• Use change impacts to identify where behavior change is needed and establish integrated approach across all work streams and business units. • Identify resources responsible for sustainment of learning content and nurturing the change agent network to include them in the design of the initial products and approaches to establish alignment. • Implement robust knowledge transfer program.
Team members, key stakeholders and business leaders work in silos and fail to harness the interconnectedness of the Transformation, resulting in wasted efforts	Use training to kick-off the project and support staff in onboarding and continuous learning throughout the course of the Transformation.
Adoption risks are not meaningfully communicated for targeted action	Leverage Transformational Risk Framework to proactively identify and manage risks to adoption in collaboration with project and organization leaders.
Stakeholders are not clear about what they need to do to prepare for change	Work with the Transformation teams to develop Personas for key roles.
Business leaders do not take ownership for their stake in the change journey	Use digital change tool (e.g. ChangeScout) as the repository for stakeholder and change impact assessment and readiness dashboards that can integrate across the Transformation for a holistic view.
Losing relationships with community organizations due to lack of time/changing players	Hiring a community digital hub coordinator to establish and maintain relationships, ensure continuity of relationships when there is a change in personnel.
Failure to get/keep NPOs and homeless serving agencies onboard with the projects that rely on them sharing data because they don't see the benefit of participating	• Start with a small number of NPO early adopters for projects, engaging closely/maintaining relationships to identify what's working, what's of benefit, and what could be improved to make it easier or yield more benefits for them, addressing any issues. • Be transparent about the progress made, successes/benefits/ROI achieved, and how we're addressing issues that have surfaced.
Increased workload for NPOs, inconsistent/invalid data, competency for data mine analysis for ROI	Staff training, train the trainers, standardized system and data standards.
Boxing out NPOs that provide important services but don't know how to use the data, then receive less funding in outcomes-based grants	• Skills training and education on how to use data. • Civic Tech Fredericton team will partner with NPOs to help them link and analyze their data in-house and when linked with other open data sources. Each member of Civic Tech Fredericton will "adopt" a Caused-Based Hub and be the go-to person for data analysis.

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Project Scheduling, Sequencing and Dependencies



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Performance Measurement

Strategic Themes

Our plan is focused on measuring performance across three key strategic themes to achieve our vision.

Collaborating to Create a Welcoming, Accessible, Supportive Community

We need to create more efficient, effective and targeted services that appropriately address resident needs to achieve increased inclusion for all residents. Modernizing our community's core technology infrastructure is a fundamental step to achieving the efficiencies we need to create the capacity to offer value-added, targeted, resident-focused services. With improvements in core systems, we will be able to conduct far more effective analysis and make evidence-based and insight-driven decisions to be able best address resident service expectations. This will also allow us to offer a higher level of tailored and more resident-friendly service.

Recognizing What is Important to Individuals

This requires a deep understanding of who our residents are and the challenges they face to enjoying a high quality of life in their community. By collecting and curating detailed data and information from diverse sources – including data from community organizations, the City's CRM, ethnographic research, and connected community apps – into the Digital Community Hub, we will be able to develop much richer information on our community needs. We will use that to develop deep insights about the issues that matter to people in our community and what impact addressing them will have, developing a much more complete profile of the people we serve and the issues that matter to them. This insight will feed into the activities under the other two strategic themes.

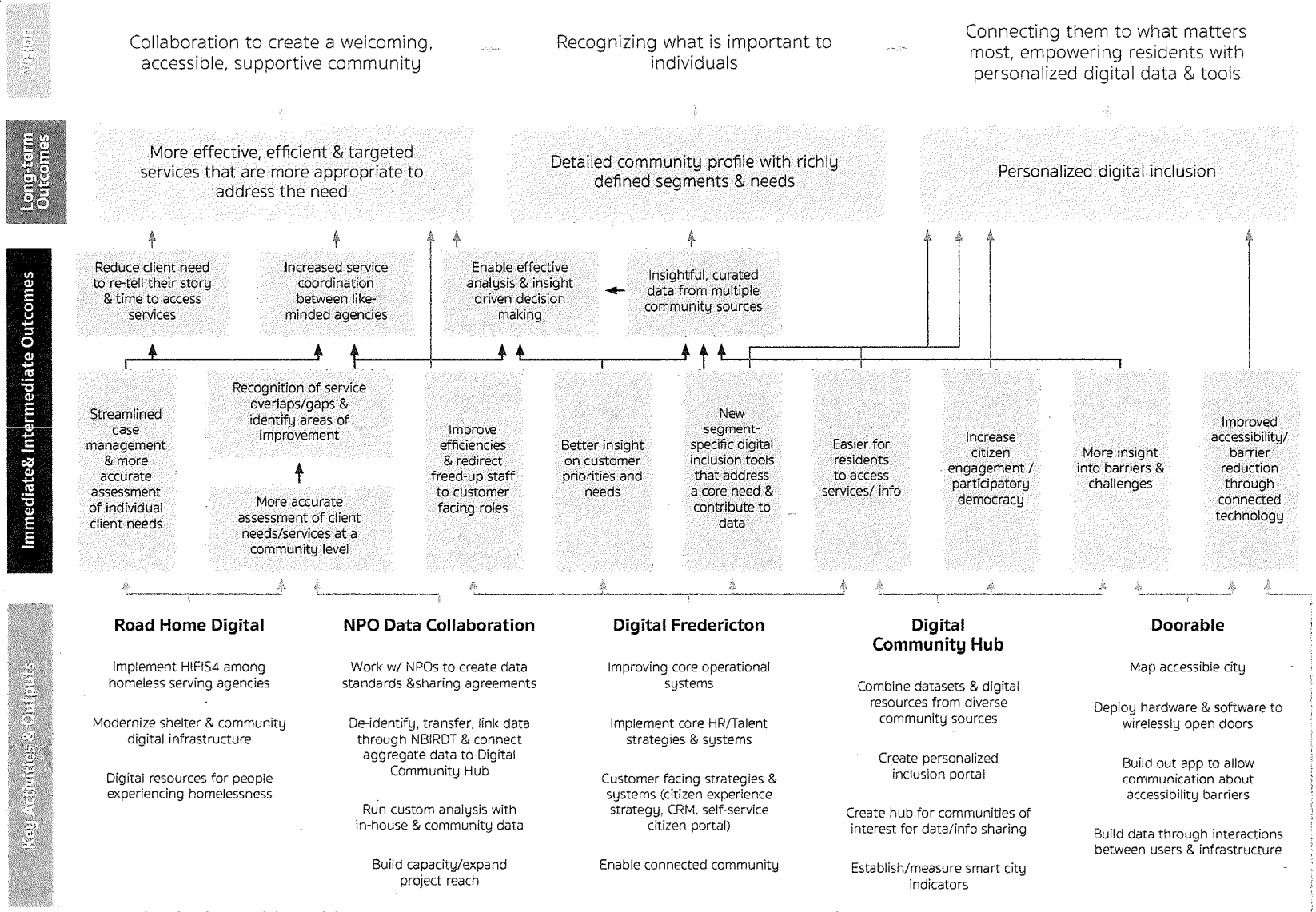
Connecting Residents to What Matters Most Using Personalized Digital Tools

Upon recognizing resident needs, we will use connected technology & digital tools to connect them to what is important. The meaningful insights we gain will inspire new solutions for under-addressed core needs and provide opportunities to further tailor how we connect people to resources they need most. By involving residents at every step of solution design, the tools created will be truly effective in both helping people find personally relevant resources to connect with their community and reducing barriers to that connection. The result will be an increase in inclusion.

There are several interconnections across project activities/outputs and outcomes. To manage performance over five years, we will monitor the three themes with metrics to track progress in achieving outcomes at each level. Following are the logical links between activities and outcomes and a balanced scorecard for each theme.

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Activities, Outputs and Links to Outcomes and Strategic Vision



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Measuring Outcomes and Performance Indicators

STRATEGIC THEME

Collaboration to create a welcoming, accessible, supportive community

LOGIC MODEL | BALANCED SCORECARD

		OBJECTIVE	MEASURE	TARGET	BASELINE	DATA SOURCE
Long-term Outcomes	Services Address Needs	Increase inclusion by providing targeted services that address needs, working in an end to end environment that puts citizen engagement first	Increased percentage of citizens who are satisfied with the supports and services to help them participate fully in the community	95%	TBD	Citizen Attitude Survey; Digital Community Hub
Immediate and Intermediate Outcomes	Increased Collaboration	Increased service coordination between like-minded agencies	Number of new service collaborations between NPOs	10	TBD	Greater Fredericton Social Innovation (GFSI)-self report
		Recognition of service overlaps/gaps & identify areas of improvement	Agencies reporting use of data to improve services	10	TBD	GFSI - self report
Immediate and Intermediate Outcomes	Streamlined Service Delivery	Streamlined case management	Clients connected to appropriate services quickly	TBD	Unknown	Shelters
			Reduction in duplicate files	0	Unknown	HIFIS4
		More accurate assessment of needs using shared data	Granting agencies using data/outcomes as a criteria for funds	2	0	United Way and Fredericton Community Foundation
		Faster more convenient City services	Increase in customer satisfaction	40%		Citizen Attitude Survey
Project Activities and Outputs	Modernize Core Systems	Implement HIFIS 4 Core	Number of agencies	9	0	Homeless agencies
		Modernize core City systems for efficient service delivery and operations	Reallocating talent from admin to customer service	4000 hrs	0	Lean 6 Sigma process reviews
			Realized operational efficiencies	38%	0	
		Develop core data tools for NPOs	Number of orgs who contribute and share data	40	0	GFSI - self report

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STRATEGIC THEME

Recognizing what is important to individuals

LOGIC MODEL		BALANCED SCORECARD				
		OBJECTIVE	**MEASURE**	**TARGET**	**BASELINE**	**DATA SOURCE**
Long-term Outcomes	**Detailed Community Profile**	Develop a detailed community profile with richly defined segments & needs	% of population captured in a one or more personas	100%	0	Ethnographic Research compared to Stats Can data
Immediate and Intermediate Outcomes	**Develop Rich Insights**	Develop rich insights into community needs through thorough analysis of diverse data inputs connected technology and people	Number of issues that have comprehensive analysis using community input	14	Unknown	Digital Community Hub Data Analyst
			Diversity of inputs used on issue analysis (organizations, individuals, research, connected technology)	>3 per issue	Unknown	Digital Community Hub Data Analyst
Immediate and Intermediate Outcomes	**Strong Community Voice**	High-level on-going engagement from community organizations, interest groups and individuals contributing to caused based hubs, identifying issues, and voicing perspectives	Number of organizations contributing data and participating in cause-based hubs	10	0	Digital Community Hub Coordinator
			Number of individual monthly users participating in the Digital Community Hub	500	0	Digital Community Hub Coordinator
Project Activities and Outputs	**Diverse Collection of Digital Input**	ID segments and develop insights, and ideas through ethnography	# of detailed segment aspirations and experience analysis	8	0	Ethnographic Researchers Completed Reports
			# of personas	24	0	
			# moments that matter	100	0	
		Develop cause based hubs for diverse community issues	# of cause-based hubs created	8	0	Digital Community Hub Coordinator
		Connect data from connected community applications to drive insights	# of segment-specific applications providing data to the dashboard	8	0	Digital Community Hub Coordinator
		Drive insights from CRM/311	Annual analysis of top 5 issues	25	0	Service Fredericton

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STRATEGIC THEME

Connecting residents to what matters, empowering them with personalized digital tools

LOGIC MODEL — BALANCED SCORECARD

		OBJECTIVE	MEASURE	TARGET	BASELINE	DATA SOURCE
Long-term Outcomes	Personalized Digital Inclusion	Increased inclusion through uptake of personalized digital inclusion tools and citizen portals	% of population using personalized digital inclusion tools	10%	Unknown	Sum of DCH users, CRM users, and users of connected community apps.
Immediate and Intermediate Outcomes	Segment Specific Tools	Create self service tools that are intuitive and help people find resources relevant to their needs and reduce barriers	Customers who rate the digital tools as highly satisfactory in connecting to what matters and reducing barriers	75%	0	Develop customer feedback areas within tools
			# of tailored tools per segment	1		Smart City Manager
Immediate and Intermediate Outcomes	Citizen Co-creation	Incorporate user-centred design iterations to improve and deploy technology that reduces barriers and improves access	Customers who provide on-going feedback on the digital tools (CRM portal, connected apps and DCH)	10%	0	Develop customer feedback areas within tools
			End user participation in user-centered design workshops	300	0	User-centred design consultants' reporting
			# of user-centered design iterations	>2/app	0	User-centred design consultants' reporting
Project Activities and Outputs	Connect Data, Ideas and Technology	Deploy technologies for user adoption	User uptake on each new tool	8%	0	Application userbase
			Market penetration for Doorable	50%	0.7%	Doorable
		Improve basic digital access	# of agencies and public spaces with digital access for clients	50	15	Fred-e Zone reporting
		Create personalized inclusion spaces	Number of unique visitors to Digital Community Hub and CRM portals	5000	0	Develop analytics on Digital Community Hub userbase
		Create rich data sets and resources for users and innovators	# of datasets in the hub	TBD	TBD	Digital Community Hub Coordinator reporting
			# of services and programs listed/linked in the hub	TBD	TBD	

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Progress Timelines, Deliverables, Milestones and Payment Schedule

The schedule of deliverables and performance milestones with a proposed payment schedule are shown on the following pages. The rightmost column shows the **progress for each performance milestone anticipated at each stage relative to the end-target**. For example, we will develop three empathy-based personas by December 2019, showing progress towards a total target of developing 24 before the end of the five-year period.

Certain deliverables have immediate performance measures within the same timeframe, while others have resulting performance measured in the subsequent period.

Deliverable Milestones	Performance Milestones	Progress and Payment
Complete Citizen Experience Strategy	Empathy based personas	3/24
Complete Digital Talent Strategy	Insightful moments that matter	12/100
Community Digital Hub team established	Segment aspirations and experience analysis	1/8
NPO team operational	Number of installations of Doorable hardware	200/200
Ethnographic research older adults	Number of agencies onboarded to HIFIS4	5/9
Map of the Accessible City Doorable initial deployment Road Home Core Infrastructure Installed	Number of users of digital access at homeless agencies per month	100
1 December 2019		**$ 1,925,000**
Complete Newcomer ethnography	Empathy based personas	6/24
Check-in companion app V1	Insightful moments that matter	24/100
Technology inclusion tools for homelessness	Segment aspirations and experience analysis	2/8
Doorable deployment & dev	Number of user centered design iterations	2
	User uptake as a percentage of segment	8%
	Number of agencies on HIFIS4	8/9
2 June 2020		**$ 620,000**
Implemented core Customer Billing	% of customers transitioned to self-serve online accounts	50%
Implement core HR Scheduling	Number of FTE hours efficiency gained	2000
Complete 1 First Nations ethnography	Empathy based personas	9/24
Develop Newcomer technology V1	Insightful moments that matter	36/100
10 NPOs on-board data project	Segment aspirations and experience analysis	3/8
	Number of user centered design iterations	2
	User uptake as a percentage of segment	8%
	Number of user-centered design iterations	2
	First 10 out of 40 NPOs	10/40
	Number of cause based hubs created	3/8
	Number of monthly contributors to the DCH	100/500
	Number of unique visitors to DCH & CRM portals	500/5000
	Market penetration of Doorable on public facilities	50%
3 December 2020		**$ 2,700,000**

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Deliverable Milestones	Performance Milestones	Progress and Payment
Complete 2nd First Nations ethnography Develop First Nations technology (a)	Empathy based persona	12/24
	Insightful moments that matter	50/100
	Segment aspirations and experience analysis	4/8
	Number of user centered design iterations	2
	User uptake as a percentage of segment	8%
	9 agencies on HIFIS	9/9
	Reduction in number of duplicate files	TBD
	Speed to connect clients to appropriate services	TBD
4 June 2021		**$ 200,000**
Implement Talent & Performance Management Implement Work Management & Field Service Complete ethnography for youth segment Develop First Nations technology (b) Create Doorable online community Create NPO data and practices toolkit DCH Release #2 Cultural Connectedness	Increase in customer satisfaction with billing	40% increase
	Number of FTE hours efficiency gained	6000
	Empathy based persona	15/24
	Insightful moments that matter	62/100
	Segment aspirations and experience analysis	5/8
	Number of user centered design iterations	2
	User uptake as a percentage of segment	8%
	Number of users on the Doorable application	2000
	Next 10 of 40 NPOs	20/40
	Number of caused based hubs created	5/8
	Number of monthly contributors to the DCH	200/500
	Number of issues that have comprehensive analysis using community input	4/14
	Number of unique visitors to DCH & CRM portals	1000/5000
5 December 2021		**$ 1,695,000**
Complete ethnography business Develop technology for youth	Empathy based persona	18/24
	Insightful moments that matter	75/100
	Segment aspirations and experience analysis	6/8
	Number of user centered design iterations	2
	User uptake as a percentage of segment	8%
6 June 2022		**$ 195,000**
Implement CRM Complete ethnography Seg G Develop business technology NPO Data analysis and aggregation Doorable scale business DCH Release #3 Economic Inclusion and dashboard	First 2000 hours reallocated to customer relationships	2000/4000
	Analysis of top CRM issues in 311 data	10/25
	Segment aspirations and experience analysis	7/8
	Empathy based persona	21/24
	Insightful moments that matter	87/100
	Number of visitors to the Digital Community Hub and CRM portals	5000/5000
	Number of user centered design iterations	2
	User uptake as a percentage of segment	8%
	Next 10 NPOs on board	30/40
	NPO testimonial reporting using data effectively	10
	Number of caused based hubs created	7/8
	Number of issues that have comprehensive analysis using community input	9/14
	Number of monthly contributors to the DCH	300/500
	Number of unique visitors to DCH & CRM portals	2000/5000
7 December 2022		**$ 1,275,000**

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Deliverable Milestones	Performance Milestones	Progress and Payment
Complete ethnography Seg H Develop technology for seg G	Empathy based persona	24/24
	Insightful moments that matter	100/100
	Segment aspirations and experience analysis	8/8
	Number of segment specific tools deployed	8/8
	Users who rate the digital tools as highly satisfactory in connecting them to what matters	75%
	User uptake as a percentage of segment	8%
8 June 2023		$ 197,000
Implement Customer Portal Develop technology for Seg H NPO data collaboration & community data DCH Release # 4 NPO Community Hub & Community Profile	Next 2000 FTE hours reallocated to customer relationship	4000/4000
	Analysis of top CRM issues	25/25
	Number of user centered design iterations	2
	User uptake as a percentage of segment	8%
	Next 10 NPOs on board	40/40
	Funding grants supported by data using outcomes as a criteria	2
	Number of organizations contributing data to the DCH	10
	Number of service collaborations between NPOS	10
	Number of cause based hubs created	8/8
	Number of monthly contributors to the DCH	400/500
	Number of issues that have comprehensive analysis using community input	14/14
	Diversity of inputs used in analysis per issue (organizational input, individual input, ethnography, connected technology)	<3
	Number of unique visitors to DCH & CRM portals	5000/5000
9 December 2023		$ 1,190,000
Interactive Integrated Personalized Inclusion	Number of monthly contributors to the DCH	500/500
	% of residents who are satisfied with services to help them participate fully	95%
	% of residents captured in 1 or more empathy based personas	100%
	% of population using personalized digital inclusion tools, DCH and Customer portal	10%
F June 2024		$ 3,000
		$ 10,000,000

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Performance Monitoring, Reporting & Evaluation Strategies and Checkpoints

Each project team will report on outcome measures, milestones and payments for the respective project. The Digital Community Hub administration, led by the Smart Cities Manager, will compile and monitor performance indicators monthly and/or quarterly (whichever is more appropriate for the measure), establishing reporting with both internal and external sources of data and sharing the information directly with all projects. Monthly cashflow variance reporting will occur as outlined the financial tools and accounting methods section.

The Smart Cities Manager will bring forward a high-level summary of project performance checkpoints and contingency measures from project monitoring as part of the quarterly progress report to the Task Force (as outlined in *Governance*). The Task Force would suggest course corrections for the project committees if not meeting objectives and a change control process if there are major project deviations.

Performance Measurement Risks and Planned Mitigations

Below are risks and mitigations identified for performance measurement.

Risk	Mitigation
Disproportionately focusing on a few select groups (not representing whole community), preventing a complete community profile	• Selecting a relatively high number of distinct segments (12), ensuring segmentation represents the entire population so each individual will be able to see themselves represented in at least one segment. • Conduct annual surveys to ensure proper capture; ongoing ethnography to identify changing needs, new customer segment profiles/personas, etc.
Lack of people using personalized digital inclusion tools due to privacy concerns and/or of real or perceived value by residents	• Being clear and upfront about how the data is collected, used, disclosed and protected through a simple consent form and in communications efforts. • Using user-centred design principles and stakeholder collaboration to directly involve users/stakeholders at each step (including post-launch) and understand their concerns related to ease of use, privacy, etc. as well as what they value. • Develop & regularly update full marketing/communication plan for all projects, with wide range of communication mediums to address concerns about value/privacy. • Conduct regular surveys to determine satisfaction, solicit feedback, and identify new and changing needs.
Lack of participation in cause-based hubs, or lack of cause-based hubs	Marketing and awareness efforts; stakeholder engagement via Digital Community Hub Coordinator working with organizations.
Lack of data sets, services, programs to include in the Hub	Research to identify data sets, and stakeholder engagement to onboard new agencies.
Inaccurate data sets to feed into Digital Community Hub	• Ensure data quality via analyst & hub coordinator. • Work with NPOs to establish data standards. • Community Hub Coordinator to work with stakeholders to identify issues and recommended fixes.
Lack of citizen engagement in co-creation process	Marketing and awareness and more targeted outreach re: user-centred design.

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No measurable change or citizen dissatisfaction with support and services created to increase inclusion	More targeted engagement to increase awareness and/or more in-depth research to better understand needs and gather insights.
Choosing inappropriate metrics to measure improvement	Segmentation research & workshops.
Transformation effort of Digital Fredericton does not make a material impact on organizational behaviours	Launch Transformation Academy to develop leadership skills and gather key feedback and insights about how they can best be supported in their role to be visible and accountable change leaders (e.g. coaching, key messages).
Digital Fredericton stakeholders have not adopted new behaviours, processes, policies, and / or tools	Embracing/adopting new learning modes: micro-learning, self-service, "in the moment", engagement as learning, etc.

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Technology

Technology Vision

Fredericton and St. Mary's First Nation will create a modern Smart Cities digital infrastructure capable of responding to an increasingly fast pace of change, providing innovative new user experiences to residents while augmenting our workforces and community service organizations to elevate our human and social capital to new heights.

We will use agile human-centred design practices and a digital mesh of platforms to create a smart city that is open, secure, interoperable and extensible. Putting digital ethics at the core of all we do, our network of interconnected personalized digital inclusion tools and services will be safe, cyber secure, with privacy and transparency built in by design. It will be governed in the public trust with data owned by the public domain.

> "It has been an honour to work with the City of Fredericton team over the past two years, as an early client of our pioneering cybersecurity engagement and risk management platform. I have experienced firsthand the skill, vision and passion the City will employ to successfully execute on their proposal. I can also attest to their commitment to cybersecurity, privacy, data and connected technology. As we strive to build the smart cities of tomorrow, ensuring they are secure and respect the privacy rights of citizens is fundamental. Fredericton's commitment to empowerment and engagement for its employees and to continuous improvement in its people, processes, culture and technology is a powerful example for other Canadian municipalities. I can think of no better Canadian city, town or village that embodies both the spirit of innovation and collaboration than the City of Fredericton."
>
> **David Shipley | CEO, Beauceron Security**

Technology Architecture Guidelines and Principles

The many technology selections, and approaches to development and integration available in the market presents a challenge in reaching and sustaining our vision. The following principles will guide our approach to mitigate the risk of selecting technologies, designs and integration methods in an ad hoc fashion that do not support our vision.

Accessibility and Usability Principles to Support the Uptake and Acceptance of Diverse Users, Residents, and Other Stakeholders

New User Experiences

There is a plethora of smart technologies being released to the market. These allow for new user experiences to be developed. New user experiences will be powered by artificial intelligence (AI) and natural language processing. More specifically Machine Learning to allow for voice enablement of services, as well as using new data sets from embedded sensors, video, and imagery to allow for an increased level of cognitive

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computing. Mobile apps will be supplemented with chatbots, conversational user interfaces and intelligent assistants.

We will use insightful moments to deliver more meaningful and personalized experiences. This connection of data, smart algorithms, and insights will lead to deeper and more meaningful interactions sharply tailored to the individual and their situation.

Design Ops

We will combine agile development, dev-ops and design thinking to create design driven engineering or "Design Ops". We will use rapid prototyping to re-engineer outcomes.

Design thinking visualizes the end experience first, then synthesizes the pieces together to achieve, augment and build toward that vision. It is human-centric and iterative.

Design-ops will fundamentally shift user experiences to interfaces that are more intuitive. Design thinking is about adopting a deeply human-centric viewpoint to redefine why and what should be built in the first place. It will refine and then perfect user experiences to create better, more enjoyable productivity – for both residents and service providers.

Augmented Workforce

Technology will not replace the expert. Instead, it will bolster the expert with new insights and data driven knowledge to serve customers better.

To be digital on the customer service side, we must first have digital process inside. We will transform and modernize our workforce including non-profits and service organizations. We will use technology to drive an efficient internal process and use digital talent management to drive customer focus. Technology will achieve new outcomes while simultaneously optimizing core operations.

Rich Data Sets

We will leverage existing, widespread data to gain exponential value from new ecosystems, to generate even more value than the sum of the different pieces, advancing the entire system of service delivery, rather than individual agencies.

This will lead to new learning about how to partner and crowdsourcing innovation to solve problems by going beyond traditional organizational and digital borders to benefit from the knowledge of people who would not normally interact.

Guidelines for Future-Proofing the Technologies

Interoperability

Interoperability is imperative in sustaining a smart city solution that will be very heterogeneous in environment, both in terms of present and future state.

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These systems encompass many layers from communications, data interfaces, service interfaces, and user interfaces like voice and IoT devices. Interoperability of systems ensures they can exchange and make use of information.

We will create a dynamic mesh that seamlessly connects people with things, algorithms, data, and future innovations, with digital personal assistants, automated agents, and other entities. Application and data interfaces will connect many systems and data sources to leverage the power of multiple platforms.

Extensibility

A key component of any smart city solution is to ensure the solution developed and implemented takes future growth into consideration. While this may seem like trying to predict the unknown, we will follow best practices to "Future Proof" the solution. Those include using loose coupling of solutions in a service-oriented manner so continued development can occur even of not all requirements are known at the onset. Taking an Agile approach to solution development will also facilitate extensibility.

Interoperable and extensible platforms create opportunities for multiple meaningful engagements for residents and enable partners to take advantage of a "mesh of interactions" and future technologies that connect to legacy data.

Access to shared data and access to add on to systems and add new features using service-oriented architecture will create solutions that are flexible enough to use in new ways that are not yet know. This will allow others to extend existing solutions in innovative new ways we have not thought of.

Scalability

In the spirit of future proofing a solution, we must ensure it will scale in many different ways including volume of data, number of users, and types of usage. Cloud based computing will be a key resource to assist with this in that it supports auto scaling of resources. We realize that might not come automatically, but wherever possible we will look for solutions that are delivered in a secure Software as a Service model (SaaS). Any solution developed will utilize cloud native resources and tools that support auto scaling.

Legislative, Regulatory and Ethical Principals

Digital Ethics

Ethics is more than just what is legally required for compliance; given what is possible through technology, it is creating that which is morally desirable. With AI and big data, the digitization of everything, and our extended ecosystem, the potential impact of secondary and unintended consequences is greater and harder to predict than ever before.

Every digital action can have an equal and potentially unintended secondary consequence and decisions we make about our digital experiences are particularly

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significant. From personal data and privacy protection, to compliance, trust and responsibility, ethics has never been so important.

We will address issues like data security, trust and privacy with guidelines of how data should be obtained and used. We will demand digital ethics from all participants who must adopt digital ethics and act with responsibility, transparency, compliance and privacy.

We will educate stakeholders on what is possible, how data is being used, and on threats and security considerations. We will manage data interactions from other repositories, establishing data sharing agreements and secure technologies to share data between platforms.

Security and Privacy by Design

Given the ever-increasing threat of cybercrimes, and the legislative requirements within the New Brunswick Right to Information and Protection of Privacy Act, we will ensure all solutions are designed with security and privacy as a foundation. This includes securing data at rest and in transit, least privilege access as well as robust monitoring and auditing. It also includes leveraging cloud native development platforms where the traditional security vulnerabilities do not exist.

Systems will be designed for privacy and security using upfront analysis, and designs that facilitate regular privacy and security assessments, reviews and audits. Designs should include audit logs that can be routinely monitored and analyzed.

Technology Standards, Architectures, and Initiatives

Developing a Smart Cities technology that seamlessly connects people to what matters most requires definition of elements at every layer of the data collection and information management process. Definition of the specific standards used for integration allows for the interoperability principle to be achieved. Each element shown in the following technology architecture is commercially available and easily deployable. Following this architecture and the guiding principles will allow for replicability and scalability.

An overall architecture is defined that includes sensors and edge devices, networks of WiFi, low powered radio, cellular, and fibre networks connecting to secure data storage platforms and linking to advance computing algorithms within a service-oriented architecture to create smart user experiences.

This Smart Cities proposal builds on a multi-cloud approach using hosted applications, on-demand infrastructure, and micro-services. In 2018, the City of Fredericton successfully launched SaaS applications for core Financial and Human Resources Management on the Oracle cloud with authentication and application interfaces using ADFS services and SOAP webservices hosted in the Microsoft Azure cloud.

The City of Fredericton has an extensive geographical information system (GIS) and open data portal already built on Esri ArcGIS. The Digital Community Hub will extend these existing resources to deploy new community-based features and services.

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Fredericton was one of the first municipalities in North America to build a community fibre network and offer free Public WiFi. Several hundred kilometers of fibre connect the city.

The City recently partnered with technology company eleven-X to pilot a new LoRaWAN IoT sensor network which is now operational and available to the community.

Our ecosystem has grown substantially over the past year and has attracted both technology partners with specialized skills, academic researches, and social innovators building technology solutions that are important and useful to people who live in our City.

Interoperable Open Architecture for a Smart City

Layer	Object	Technology
Intelligent Adaptive User Applications	Enterprise core applications	Oracle ERP, Human Capital, and Work Management
		MS Dynamics 365 CRM
		HIFIS 4
		ESRI Geographic IS
	Digital Community HUB	ESRI ArcGIS Community Hub
	Connected community applications	Doorable
		LiveKool Check-in
		Hullo & Future Development
Smart Algorithms and Microservices	Serverless computing	Amazon S3, AWS Lambda
	Identity management	AD B2C, Cognito
	Access and authentication	MS ADFS
	Recommendation engines	Amazon Personalize
	Chatbot and voice recognition	AWS Lex
	Machine learning	SageMaker on AWS
	Computer vision	Amazon Rekognition
Service Oriented Architecture	Web Services	SOAP
	Application Programming Interfaces	JSON REST APIs
	IoT device data brokering	MQTT
Infrastructure and Storage	Database storage	AWS RDS and S3
	Open Data	ESRI Open Data Hub
	Secure data storage and analytics	NBIRDT
	Cloud backup	MS Azure Blob
	Infrastructure and servers	MS Azure, AWS EC2
Network	Municipal fibre network	F6 Networks
	Public WIFI	e-Novations
	Cellular 4G, 5G	Rogers
	Telemetry IoT network	LoRaWAN by eleven-X
	Security monitoring	IBM Q-Radar
Edge Devices	WIFI Access Points	Fortinet
	Cameras	Cisco
	Smart water meters	eleven-X
	Digital displays	Samsung
	Urban telemetry sensors	LoRaWAN IoT protocol

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Technology Partnerships and Collaboration

Open integrated architecture creating a digital mesh of interactions requires an open and integrated collaboration of technology partners.

One key partner, Deloitte, started with us on our journey, supporting our vision to digitally transform. Our strategic relationship with Deloitte includes a combination of project support, in-kind contributions, and general transformation management activities that will span core, e-government (customer experience) and connected community strategies, with designs and implementations. The relationship is likely to evolve over that timeframe, given the rapid pace of technological and other change that will occur.

A strong partnership, with a unified team focused on delivering value to our community through innovation, is able to build and sustain a strong innovation ecosystem and community.

> "We are proud of the milestones that the City and Deloitte have achieved together thus far. We are also thrilled to have the opportunity to continue to collaborate, along with community groups, Oracle and other private companies, and others to achieve the Digital Fredericton aspirations of improving quality of life and driving economic prosperity. We are confident that together, an ecosystem will mature to fundamentally change the way the City works and interacts with its citizens."
>
> **Greg MacQuarrie | Partner, Deloitte**

Roles and Responsibilities of Technology Partners

Deloitte – Transformation leadership and visionary support; Core systems implementation Oracle Cloud Integration; global perspectives and Smart Cities insights

Blue Spurs – Technology Innovation leadership; Adaptive Smart Application extensibility to other digital systems; serverless application development for connected applications; technology support for Civic Tech Fredericton; adoption and implementation of AWS smart algorithms; innovative edge devices with smart algorithms

Bulletproof – Cybersecurity monitoring using IBM Q-Radar and security operations centre; threat hunting and risk assessment; training and development of cybersecurity workforce

Civic Tech Fredericton[1] – Technical learning, volunteer and collaboration opportunities for developers and social innovators; analyze and visualize data and develop applications and microservices to provide technical solutions to social issues for non-profit agencies;

[1] The City of Fredericton works together with Blue Spurs to provide AWS cloud infrastructure and microservices to Civic Tech Fredericton. Volunteers from Blue Spurs provide training and leadership in building advanced applications based on AWS cloud technology. www.civictechfredericton.com

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develop social applications on the AWS platform, using low cost and scalable infrastructure.

eleven-X – Engineering, support and delivery of public IoT network using LoRaWAN; supply urban sensors and build out smart city telemetry devices and data; provide smart city sensor data through Open Data Portals and APIs.

Esri Canada Ltd. – Expertise in geographic information systems; in-kind support and development of the Digital Community Hub.

F6 Networks – Maintain and extend Fredericton's metro fibre infrastructure; provide gigaburst, high bandwidth internet connectivity.

NBCC-NSERC Industrial Research Chair in Mobile First Computing – Provide applied academic research in immerging UX design.

Rogers – Innovation investments in Fredericton; provide LTE networks for IoT extensions; provide data connections on municipal transit to enable public WiFi.

Results of Testing and/or Piloting in Finalist Phase

To prove out development methods, guiding principles and technologies, many of the technology architectures have been used by the City in production environments or prototyped with pilot projects during the finalist phase. The links below are to working prototypes or minimum viable products. Please visit www.fredericton.ca/smartcity for more information about these prototypes with video content and latest developments.

Doorable (minimum viable product, version 1.0):
https://play.google.com/store/apps/details?id=com.appdigenous.doorable
(also available on the Apple App Store)

Digital Community Hub (prototype of features and functions):
http://fredericton-dashboard-fredericton.hub.arcgis.com/

Velocity CRM Portal (functioning pilot, integrated with back-end systems, not publicly launched): https://cof.microsoftcrmportals.com/en-US/submit-a-service-request

Hullo (prototype setup for android device):
https://drive.google.com/drive/folders/11EvGboyBSSwi08f-RxlLmKaJFLrnQVAo?usp=sharing

LoRaWAN Telemetry IoT network (pilot project using parking sensors):
https://demoapp.eleven-x.com;
User Name: fredericton.parking@eleven-x.com , Password: parking

Companion Check-In and Online Community Support Tool (prototype used for market testing): http://livekool.com/nonprofit

Real-time Data integration of IoT LoRaWAN network with Digital Community Hub (MQTT and JSON APIs protocols for interoperable application and data integration):
http://how-are-we-doing-fredericton.hub.arcgis.com/

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"Shortly after we started working with the City of Fredericton, it became apparent that this is not your average city. First, they already had an impressive amount of Smart City infrastructure in place. Specifically, they had their own fiber network, city-wide Wi-Fi, and an impressive operational open data platform. In addition, they were already working with a local company to develop a smartphone app to help people with accessibility issues. Impressive for any city of any size, in my humble opinion. Second, they move at lightning speed compared to any other city we have encountered. For example, the RFP was issued in September and awarded in October, our network was deployed several weeks after that and the in-ground parking sensors were installed shortly after that. In around three months they went from initiating the RFP to getting real-time parking data. Third, they listened to their community to find out what is important to them, structured their Smart City Challenge Statement around that, and found an innovative way to address the challenge with technology. The first parking spots that Fredericton choose to monitor are the accessible parking spots. The data is being fed into their existing open data platform and from there into the accessibility parking app I mentioned earlier. Fourth, in case it is not obvious, Fredericton is willing to take risks and be early adopters. I can tell you this is very uncommon for cities, but it is a fundamental and often overlooked ingredient required to truly achieve innovation."

Ryan Hickey | COO, eleven-X

Technology Risks and Planned Mitigations

Risk	Mitigation
Digital tools/platforms/apps are not user-friendly	Employing user-centred design workshops/usability testing throughout ideation/prototyping/development stages as well as post-launch.
Personal Privacy	Annual privacy audit, PIA and guidance, governance subcommittee.
Cybersecurity	Monitoring, threat assessments and threat risk assessments from Bulletproof Security Operations Centre using IBM Q-Radar appliance.
User acceptance and usability	Iterative user-centred design, reporting on monthly users.
Workforce efficiency	Lean 6 Sigma reporting to performance subcommittee.
Interoperability	• Develop and document an integration strategy that defines the service-oriented architecture and interface protocols to be used, and the application service end-points. Publish the documentation on the Open Data portal. • Maintain a central library of documented system interfaces and with subscriber list.
Knowledge gaps	Create networks of systems experts through Civic Tech and business partners, hire staff with existing skills, train internal staff on new protocols.
System architecture – the current infrastructure is not ready to build out a project of this magnitude.	Review and update internal architecture in parallel. Understand the implications of lack of infrastructure readiness on organizational success and team adoption.
Abandoned platforms HIFIS-Feds; NB-IRDT, NPOs	• Federal housing agreement renewal, NBIRDT agreement renewal. • Maintaining relationships among adopters.

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Governance

Governance Frameworks and Strategies

The Smart Cities Program and the initiatives and projects in this proposal will be governed by the Fredericton Smart Cities Task Force comprising 15 members outlined below representing a broad community of interests. Meetings will be held quarterly. The Task Force's primary role is an advisory one with respect to the overall progress of the Smart Cities Challenge and its five projects. Reporting will be by way of quarterly progress reports furnished by the Smart Cities Manager, which will include projects' progress, marketing/communications/engagement and budget. The Task Force will provide input with respect to issue management, mitigation strategies, change control process if there are major project/cost deviations, and ensuring data, security and legislative compliance requirements are executed (including an annual privacy audit).

Fredericton Smart Cities Task Force Composition:

1. Fredericton Smart Cities Task Force Chair
2. St. Mary's First Nation designate (ex-officio)
3. Smart Cities Manager (ex-officio)
4. Fredericton City Clerk / Privacy Sub-Committee Chair (ex-officio)

Five Project Committee Leads representing:

5. Non-Profit Data Collaboration (Greater Fredericton Social Innovation)
6. Road Home Digital Platform (Community Action Group on Homelessness)
7. Digital Community Hub (WSP)
8. Doorable (Appdigenous)
9. Digital Fredericton (City of Fredericton)

Academic, Commercial and Social Oversight:

10. University of New Brunswick
11. New Brunswick Community College
12. Fredericton Public Library
13. Rogers
14. Blue Spurs
15. Deloitte
16. Fredericton Community Foundation
17. Stan Cassidy Centre for Rehabilitation
18. Hotspot Inc.
19. Ignite Fredericton
20. United Way

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Friendship Accord

This governance structure has representation from City of Fredericton and St. Mary's First Nation. Building on this governance structure, the two communities intend to enter a Friendship Accord. The Friendship Accord is a framework for mutual governance of broader community issues of mutual interest.

A Friendship Accord "creates the opportunity to outline why and how two (or more) communities would like to build and sustain their relationship over the long term [...] to:

- strengthen the relationship and provide a framework to undertake joint work
- provide structure, although this not a legal document or a business agreement
- inspire and guide the long-term relationship
- celebrate with the broader communities and regional partners
- formalize the spirit, intent and cooperative agreement of the partnership."[2]

Program Administration

The Fredericton/St. Mary's Smart Cities Challenge initiative will be managed by the **Smart Cities Manager**, who is responsible for:

- Managing the Digital Community Hub administration and staff (including the Digital Community Hub Coordinator, Data Analyst, and Hub Content Creator; see "Human Resource Requirements in *Project Management*).
- Liaising with project committees to facilitate the successful implementation of projects.
- Managing budget oversight, and funding disbursements to the five projects.
- Reporting to Infrastructure Canada.
- Coordinating quarterly Fredericton Smart Cities Task Force meetings including report generation (quarterly progress reports, budget, issue management).
- Managing strategic marketing and communications for the Smart Cities Program as it relates to Fredericton's brand. This includes the development of an integrated marketing communications plan (encompasses the public awareness element/storytelling, leveraging partnerships with respect to marketing, public relations, refreshing GoFred brand, elevating Digital Fredericton brand, etc.).
- Cultivating and fostering stakeholder relations/partnerships.
- Managing Smart Cities Innovation Lab, and liaising with potential and existing entrepreneurs as it relates to Smart Cities app development – connecting them with partners/staff and funding.

Privacy

There will be a Smart City Task Force Privacy Sub-Committee – chaired by the CoF Chief Privacy Officer (City Clerk) or his/her designate and will be comprised of representatives

[2] "Relationship/Friendship Accords." *CEDI.* Cando. http://www.edo.ca/cedi/relationship-friendship-accords

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from each of the five project committees, plus a representative from St. Mary's First Nation, a privacy subject matter expert, Virtual Chief Information Security Officer/Bulletproof Security Operations Centre, and a representative each from NB-IRDT and Service Canada. The Committee will be responsible for developing privacy frameworks and their privacy policies, procedures, protocols, consent forms and data sharing agreements as necessary and submitting them for approval to the Task Force. The Privacy Sub-Committee would ensure an annual privacy audit.

Financial Oversight

Funding received from Infrastructure Canada will be disbursed by the City of Fredericton. The Smart Cities Manager will be responsible for maintaining the budget and funding disbursements based on allocations as per the Smart Cities Challenge submission. Quarterly reports – or prescribed reporting format as per Infrastructure Canada requirements – will be presented to the Task Force by the Smart Cities Manager to inform of progress and deviations which could result in change control.

Digital Fredericton Program & Project Governance

Due to the magnitude of the Digital Fredericton initiative, a **Program Level Leadership Team** will be assigned to the Digital Fredericton Transformation. The Leadership Team is made up of leaders across the City of Fredericton's lines of service and relevant Deloitte service lines and responsible for planning, priority setting, overseeing and delivering against the commitments inherent to achieving the Digital Fredericton vision. Each Digital Fredericton project will be governed by a project charter and statement of work when it involves partnering with external partners. Each Digital Fredericton project will have its own project team, with projects of significant size and scale including the following elements: Project Steering Committee; Executive Sponsor; Project Manager; Project Subject Matter Experts; Project Team Members; Change Management Team; Technical Leads (where appropriate); other roles defined as appropriate.

Project Committees

The five project committees (Digital Fredericton, Digital Community Hub, Doorable, Road Home Digital Platform and Non-Profit Data Collaboration) will comprise:

- **Project Lead** – Setting and managing direction and overall project deliverables.
- **Subject Matter Experts** – Providing insight and subject matter expertise and support.
- **Team/Project Resource Support** – Providing team support, assistance and resources to support the project including administration, maintaining budget, reporting, etc.
- **Creative Lead** – Innovating and pushing the team to advance outcomes through creative thinking.
- **Additional Resources** – as deemed appropriate by the project lead.

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The committees will be responsible for setting their meetings and their project plan deployment (including maintaining project schedule, budget), monitoring/controlling outcomes as per set performance measurements to receive funding disbursements, managing risks, partnerships, recording minutes and providing quarterly report inputs to the Smart Cities Manager regarding project progress and budget.

Role, Capacity and Partner/Stakeholder Readiness

Role	Organization & Contact		Impact/Influence & Capacity/Readiness
Co-Applicant	Mike O'Brien *Mayor, City of Fredericton*		Municipal decision-making on behalf of City Council Fully committed to the success of this initiative providing significant human and financial resources.
Co-Applicant	Alan Polchies *Chief, St. Mary's First Nation*		SMFN decision-making on behalf of Band Council Fully committed to the success of this initiative providing First Nations oversight.
Digital Fredericton Transformation Partner	Greg MacQuarrie *Partner, Deloitte*		Long-term strategic partner investing $1 M to date in helping to achieve the Digital Fredericton vision.
Technology provider	Alex Miller *President, Esri Canada Limited*		Provided over $50,000 in technology and supporting services to develop the Digital Community Hub prototype. Committed to provide $20,000/year in professional services to further support the development of the Digital Community Hub.
Digital Community Hub Research & Data	Dr. Jeff Rankin *Dean of Engineering* *University of New Brunswick*		Provided comprehensive research on smart city indicators and data sets to include in Digital Community Hub.
Digital Community Hub Project Management	Dr. Anna Robak *Research Manager, Innovation & Future Ready, WSP Canada*		Provided in-kind project management services for the development of the Digital Community Hub.
Innovation Partner	Troy Harnish *Rogers*		Providing in-kind services to support Fredericton's innovation/Smart Cities agenda.
Innovation Partner	Ryan Hickey *eleven-X*		Supporting Fredericton's smart cities agenda to deploy/operate LoRaWAN wireless IoT network to enable future application development. Eleven-X is contributing half the cost of the next 1000 network connections – valued at $12,000.
Innovation Partner	Mike LeBlanc *CEO, Blue Spurs*		Providing strategic innovation oversight with respect to the Smart Cities Challenge projects.
Smart City Task Force / Project Committee Members	***Project Leads*** Digital Fredericton – Valerie Kelly Digital Community Hub – Anna Robak Appdigenous – Melissa Lunney Non-Profit Data Collaboration – Sandi MacKinnon Road Home Digital Platform – Faith McFarland		These organizations/ representatives have been selected based on their unique contributions, capacity and subject matter expertise to impact the success of projects.
User-centred design provider	Greg Phillips & Chelsea Wilson *Accreon*		Providing in-kind user-centred design valued at $1500 for the Digital Community Hub.
Road Home Platform Early	Warren Maddox *Fredericton Homeless Shelters*	Julia Galant Daigle *Youth in Transition*	Partnering to pilot/adopt new HIFIS4 shared client management platform.

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Adopters of HIFIS4	John Barrow *John Howard Society of Fredericton*	Lisa Edwards *Capital Region Mental Health & Addictions*		
Doorable Early Adopters	James Blanchard, *City of Fredericton*	Sally Brooks *St. Mary's First Nation*		The City of Fredericton and St. Mary's have committed their readiness as an early adopter of the technology, and to conduct user testing. Two for-profit organizations have come on board as private sector adopters.
	Tim Woods *Brookside Mall*	Larry Shaw *Knowledge Park*		
Non-Profit Data Collaboration Early Adopters	Sandi MacKinnon *GFSI*	Alex Boyd *Greener Village Food Centre*	Betty Daniels *Meals on Wheels*	Led by GFSI, 11 NPOs are participating as early adopters in the NPO Data Collaboration Project.
	Jess Baxter *Alzheimer Society of New Brunswick*	Fiona Williams *Liberty Lane*	Julia Gallant Daigle *Youth in Transition*	
	Christin Swim *Skigin-Elnoog Housing Corporation*	Erica Young *Opal Family Services*	Jan Wambolt *Wil-Doo Cycle*	
	Karen MacAlpine *Fredericton Boys & Girls Club*	Fiona Williams *Partners for Youth*	Julia Stewart *Fredericton Library*	
Non-Profit Data Collaboration Support Partners	Karina LeBlanc *NB Social Policy Research Network* *Pond-Deshpande Centre*			Strategic support partner.
NPO Data Infrastructure	Dr. Ted McDonald *Director, NB-IRDT*			Key partner of the NPO Data project equipping NPOs with tools, enabling the transfer of aggregate data to connect with provincial data infrastructure.
NPO Data Support	Dr. Jules Maitland *Co-Founder, Civic Tech Fredericton*			Supporting the NPOs on how to link data sets, utilize visualizations tech, perform analysis for better decision making, and design tech solutions to address social issues.
NPO Data Standards Coordination	Sarah Campbell *Research Manager, NB Social Development* (Social Pediatrics)			Funding $80,000 Data Standard Specialist to develop standardization for NPO project.
HIFIS4 support	Randy Hatfield *Saint John Human Development Council*			Funding part-time HIFIS Coordinator to onboard and coordinate HIFIS4 deployment valued at $35,000.
AbilityNB	Haley Flaro *Executive Director*			Provincial organizations for persons with accessibility challenges/Appdigenous partner.
NBCC	Dr. Marilyn Luscombe *NB Community College*			Provincial community college network and integral Appdigenous partner.

Please refer to attached supporting documentation for the aforementioned partnerships and other letters of support. Please see the proforma budget in *Financial* outlining the value of in-kind contributions/financial arrangements.

Retaining Community Control Over Sensitive & Personal Data

Individuals of the community will be the rightful owners of their own personal information. (See *Data and Privacy* for more detail.) Community ownership of aggregate or de-

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identified personal information through the Digital Community Hub will be the hallmark of the partnerships between the City of Fredericton's initiatives and others undertaken as part of the Smart Cities program. Decisions about community aggregate data availability will flow through the Fredericton Smart Cities Task Force. As well, the OCAP principle (Ownership, Control, Access, and Possession) will be the guiding principle of all personal and aggregate data obtained through the partnership with St. Mary's First Nation.

Governance Risks and Planned Mitigations

Risk	**Mitigation**
Breakdown in collaboration between the City of Fredericton and St. Mary's First Nation due to diverging priorities	• Continue to focus on developing the Friendship Accord • Regular joint briefings between City and St. Mary's elected officials and staff
Keeping stakeholders engaged in the governance process and fulfilling their oversight responsibilities	• Set expectations with Task Force members through written roles, responsibilities and expectations of task force members • Semi-annual survey of Task Force and committee members on their satisfaction and effectives of the governance process.

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Data and Privacy

The personal privacy issues for the initiatives and projects in this proposal are as complex and challenging as the overall endeavour is ambitious, innovative, and entrepreneurial. An in-depth focus on cybersecurity and privacy will be incorporated across all layers of the Digital Fredericton transformation.

Principles

The Fredericton Smart Cities Task Force's Privacy Committee has committed to the following 10 principles to serve as signposts as it moves to ensure privacy compliance for each project: **Respect; Anonymization; Control; Necessity; Consent; Community Ownership; Consultation; Access; Transparency, Accountability, and Open Government; Security.** See a complete description of the 10 Privacy Principles at www.fredericton.ca/smartcity.

Preliminary Privacy Impact Assessment

To address the privacy issues, a preliminary privacy impact assessment (PPIA) was completed by Robert P. Doherty Access and Privacy Services (RPDAPS). Mr. Doherty has almost 25 years' experience in information access and privacy including ten years as an information access and privacy consultant and lawyer. His approach to developing and preparing a privacy impact assessment is one of common sense and attention to detail in rooting out the privacy risks of any project according to the Canadian Standards Association (CSA) ten fair information/privacy principles and relevant legislation and to provide realistic mitigation strategies that address the privacy compliance risks. As part of the development of the PPIA, the Office of New Brunswick's Integrity Commissioner was also consulted and was provided with a copy of the draft PPIA with a request for comment. Adjustments were made to the PPIA and its related materials based on the feedback received from the Office.

The PPIA examined each of the initiatives/projects according whether at this point they were compliant with each of the ten CSA privacy principles and relevant privacy legislation.

Privacy Compliance

Our ambitious proposal creates privacy challenges for each of the projects it encompasses as they not only encounter four applicable privacy laws, but also involve organizations with varying degrees of familiarity with privacy principles and use of privacy management tools. The relevant privacy legislative obligations for the main initiatives/projects are:

- Digital Fredericton & Digital Community Hub – New Brunswick Right to Information and Protection of Privacy Act (RTIPPA)

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- Doorable (Appdigenous) – Personal Information Protection and Electronic Documents Act (PIPEDA)
- Non-Profit Data Collaboration – RTIPPA and the Personal Health Information Protection and Access Act (PHIPA)
- Road Home Digital Platform – PHIPA and the Federal Privacy Act

The PPIA has taken into account the privacy obligations of the relevant legislation on each project, **reviewing and assessing the privacy compliance requirements of the ten Canadian Standards Association Fair Information/Privacy Principles each project** as well as the projects overall with respect to:

- the seven principles of Privacy by Design developed by Dr. Ann Cavoukian, former Ontario Information and Privacy Commissioner
- the letter sent to the Minister of Infrastructure Canada from the Information Commissioner of Canada and the information and privacy commissioners or their counterparts across jurisdictions in Canada.
- input from the Office of the New Brunswick Integrity Commissioner responsible for the New Brunswick Right to Information and Protection of Privacy Act (RTIPPA) and the New Brunswick Personal Health Information Protection and Access (PHIPA) Act.

The PPIA also sets out the ten privacy principles set out by the Fredericton Smart Cities Task Force's Privacy Sub-Committee.

Applicable provisions in the relevant legislation are expressed in each of the 10 privacy principles and are assessed in the privacy impact assessment.

Essentially the proposed data management plan is comprised of two major components:

- a privacy management framework for each project
- an information technology infrastructure and security plan and/or policy for each project

The PPIA indicates that for most projects, with the exception of Non-Profit Data Collaboration and Road Home Digital Platform, the security plan for the IT infrastructure that will be used to facilitate is in its formative stages. The exceptions are the IT infrastructure that is already in place at NB-IRDT and the Department of Health for Non-Profit Collaboration and the HIFIS4 System developed by Service Canada. The data provided to both of these organizations by non-profit organizations and homeless serving agencies will be collected securely through the IT infrastructure of these organizations, and will be housed on secure platforms there as well.

As well, there is little in the way of privacy management frameworks and the organizational tools, policies, procedures, and protocols for all projects and participating agencies. The exceptions are Non-Profit Data Collaboration and Road Home Digital Platform. Although non-profit organizations and homeless serving agencies participating in these projects appear to have limited familiarity with the need for such frameworks, their project partners (NB-IRDT, N.B. Department of Health for the Non-Profit Data Collaboration Project and Service Canada with its HIFIS4 System for the Road Home Digital Platform project) appear to have robust privacy frameworks for protecting the personal data they will receive as part of the project.

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The full data management plan for all projects will be created in accordance generally with the ten CSA privacy principles' requirements, and specifically in compliance with the provisions of the relevant legislation for each project. Thus, the requirements of the following pieces of legislation are the basis of the privacy assessment for each principle, and the mitigation strategy recommended alleviating and minimizing privacy risks:

- the Right to Information and Protection of Privacy Act (RTIPPA) for each principle for Digital Fredericton, Digital Community Hub, and Non-Profit Collaboration;
- the Personal Information Protection and Electronic Documents Act (PIPEDA) for Doorable;
- the Privacy Act for Road Home Digital Platform; and
- the Personal Health Information Protection and Access (PHIPA) Act as well for Non-Profit Collaboration and Road Home Digital Platform.

The need for such a data management plan is reflected in the legislative obligations that apply to each project. The provisions that apply to determine the specific privacy compliance obligations under each principle in each piece of legislation are not identical. However, there is enough similarity among the different provisions in each relevant privacy law and the CSA privacy principles, except areas such as data matching and common or integrated service delivery, to base the obligations on the applicable principle. Because the obligation in each CSA principle is reflective of the similar legislated obligations for each principle, this was the basis, with the exception noted, of the privacy assessment and will be the basis of the data management plans developed for each project in implementing the mitigation strategies for each project. In short, the data management plans will be compliant not only with each CSA principle, but also to the specific legislative requirements of the relevant privacy laws. The only differences will be in the degree of detail that is required in each law.

Types & Methods of Data Collection, Use, Retention and Disclosure

Personal information will primarily be collected from residents through online engagement, service use (e.g. Doorable), and dialogue. The ethnographic research will collect personal information through online one-on-one video recording and notes made by session facilitators. Other personal information collected by other projects will be done through data entry, either by project representatives or citizens engaging in online dialogue with project representatives.

The personal information will, where possible, be aggregated and de-identified and provided to the City of Fredericton for analysis, policy development and assessing service performance and determining overall service delivery needs or approaches for citizens. Personal information will be, according to the legislative authority relevant to each project, retained according to retention and destruction schedules consistent with the Municipal Records Authority (MRA), NB-IRDT, the New Brunswick Department of Health, and the federal government, and future record retention polices that are expected to be developed by the Government of New Brunswick.

The total life cycle of the personal information collected on all projects will be consistent with these policies, but as noted above, apart from the City of Fredericton and the data

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life cycle policies that are part and parcel of NB-IRDT and Service Canada, there will be a need to provide resources for the development of such policies.

Security and Privacy Considerations

From the beginning, privacy and security considerations, particularly those of the seven principles of Privacy by Design, have been and will be dominant in the development of IT infrastructure that will serve each of the projects. The City of Fredericton, in particular has already in place robust privacy and security protections built into its existing infrastructure. Plans for additional IT infrastructure, as noted in Appendices D & E of the PPIA also will include industry standard privacy and security features to protect personal information. In the initial engagements with citizens, there was little if any privacy and security concerns raised as the focus was initially on designing a vision for the future of a city that epitomized a future digital Fredericton that connected and provided services that meet the needs of the citizens of the city most effectively.

Adhering to Principles

Governance

A proposed governance structure has been developed for this initiative that recognizes the homogeneous participation in each project at all levels. Thus, project leads, technical, academic, social innovation, and privacy expertise will be part and parcel of the decision-making process as projects roll out their programs. As well, there will be a privacy checkpoint for all projects that will review progress in the development of the various mitigation strategies designed to ensure privacy compliance with the ten CSA Privacy principles and relevant legislation. A commitment has also been made to engage with residents about the plans for each project prior to each project becoming fully operational, including how their personal information that they provide in the implementation of each will be protected.

Ownership and Control

The concept of community ownership of aggregate data and individual control of personal data through the use of well-structure informed consent forms, and audits of collection, use, and disclosure of personal information on each project is important. It has been and will be dominant through the planning and implementation process for the overall initiative. It is also the intent and goal to provide as much relevant open aggregate data through the Digital Community Hub open online portal. This will not only allow reporting on the progress of each project attaining its goals, but also in providing aggregate data and analysis that encourages economic development in the community. As well, the project recognizes and will implement the First Nations Information Governance Centre Principles of Ownership, Control, Access, and Possession (OCAP) in dealing with personal and community based aggregate information of St. Mary's First Nation, a full partner in the Smart Cities initiative.

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Consent

Consent will be the hallmark of each project in requesting citizens to provide their personal information in identifying their service needs and to engage in dialogue with the City. While at this point, there is a variety of consent forms, or no consent form at all for some projects, the future will be marked by use of a solid informed consent form that provides specific information about the purpose of collection, the limits on future use and disclosure, and the retention periods and security protecting personal information they provide. Residents will have the option to opt-out of consent at any time, in accordance with the consent principle developed. For more information, refer to the PPIA, section 8c "Consent" on page 38.

A solid consent form guidance document with a template that can be adjusted to the uniqueness of each project has been prepared for use by each project. As well, to encourage projects to limit their collection of personal information only to that information that is necessary for the effective delivery of the project, a draft data collection template has been developed for use by each project.

Data Minimization and De-Identification

All Smart Cities Challenge projects will retain personal information only within their IT infrastructures for use to deliver services to client or user base. Some de-identification will be possible (and would be done at the earliest opportunity where appropriate) through the use of unique numerical identifiers for this data. However, on the whole, the identifying information will continue to be needed for providing effective services, or confirming identity. For disclosure outside of the individual projects, all personal information will be aggregated or de-identified. This will provide snapshots of the effectiveness of particular services as well their progress in meeting service delivery goals and where appropriate will enhance the data sets on the Digital Community Hub. Other uses would include being able to map an "accessible" city in the use of the Doorable app for the accessibility community, particular research projects through NB-IRDT through data obtained through the "Crosswalk" process, and service delivery analysis for the Road Home Digital Platform. This will all be done by developing appropriate software or approaches to aggregating or de-identifying data with appropriate privacy protections within each application.

Accessibility

At the heart of the initiative is the Digital Community Hub, which will be used as a conduit to providing meaningful data on an open government online portal. This should encourage development of improved service delivery options, real time census data, and economic development and entrepreneurial innovation. This goal will be achieved through open source data gathered by City of Fredericton researchers, and aggregated data from most of the Smart Cities projects. In particular ethnographic research, feedback from accessible app users of Doorable, and aggregate data from the Road Home Digital Platform with respect to homeless individuals will also be used. The Digital Community Hub is the portal and the community engagement sessions that will encourage dialogue

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about different approaches and economic development opportunities will be one of the key mechanisms. These mechanisms will take the informational seeds on the Digital Community Hub and provide opportunities for them to grow in fertile environments.

Security

As noted earlier, the information technology infrastructure for the majority or projects (Digital Fredericton, Digital Community Hub, and Doorable) is still in the conceptual or early development stage. However, in the course of providing information for assessment in the PPIA, these projects have discussed or provided evidence of concrete plans to incorporate industry standard privacy and security features in the development of information technology infrastructure for the project. The test ultimately will come when a final privacy impact assessment examines the degree to which these features have been included. Non-Profit Data Collaboration and Road Home Digital Platform, based upon documentation reviewed for these projects, have acceptable privacy and security features in their information technology infrastructure resident in NB-IRDT and the HIFIS4 Platform.

Open and Big Data Strategies

At the heart of this proposal is the objective of capturing a real-time snapshot of the city and its citizens and determining their program and service needs, and the current capacity to address those needs physically and socially. Existing data sets from national counts or surveys, or no data sets at all, are inadequate to provide that determination either because of time lags, privacy, or no data at all because marrying needs with physical, social, and geographic access has been difficult.

While each of the projects will collect and retain personal information of residents to improve personal experiences with programs and services, that personal data will be de-identified or aggregated as well. There are privacy risks and challenges in that overall process that require mitigation strategies as noted in the PPIA. But there are also tremendous opportunities to address that data deficit. Policy and decision makers using analytical tools with the aggregate and de-identified personal information should be able to improve service choices for residents.

Data and Privacy Risks and Planned Mitigations

The PPIA developed for this proposal used a common-sense approach to identifying privacy risks for its main initiatives. It identifies privacy risks based on the ten CSA privacy principles and proposes practical mitigation strategies for projects where, although guided in the past by confidentiality approaches to personal information, would have limited privacy and security data management frameworks. The strategies identified are realistic relative to the current privacy expertise of the organizations and individuals guiding these projects, and to the required development of frameworks. Resources will be made available to guide these projects to achieve their privacy objectives.

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The need for such frameworks has not only been readily recognized by the project proponents, but embraced in the expressed desire to ensure that the projects will be "doing it right" when it comes to establishing a privacy culture within not only the project, but within their organization.

The privacy risk assessment for the 10 CSA principles involves also a variety of existing compliance by projects. There are mitigating strategies suggested relative to compliance with all of these principles, but for some, mitigation will only involve using preparatory work already done to mitigate the risk (e.g. consent guidance, data element template to determine the "necessity"). See the table below for identified risks and their mitigations. The scoring for each of these risks is available in the PPIA.

Risk	**Mitigation**
Lack of accountability	• Putting in place overall governance structure for the initiative and formally/publicly identify individual/position responsible for privacy on each project.
Lack of clear identified purpose of data collection/use, etc.	• Develop and use a consent form that clearly identifies the specific purpose(s) for the collection, use and disclosure of personal information.
Lack of meaningful consent	• Develop and use a consent form that clearly identifies the specific purpose(s) for the collection, use and disclosure of personal information, as well as the length of time it will be retained and what security there will be around it; review this annually by an independent third party; for NPO and Road Home develop/use a specific informed consent form for future collections of personal information by clients.
Failing to ensure appropriate respect for First Nations data and community privacy	• All stakeholders will collaborate closely with St. Mary's First Nation • Projects follow OCAP principles
Collecting more personal information than is necessary to achieve project goals	• Modify and use a data element collection template that requires explanation of why each data element is necessary for Digital Fredericton, Digital Community Hub and "Doorable"; review by a third party annually.
Failure to limit use, disclosure to what is necessary	• Develop and use a thorough informed consent form for clients interacting with the project that specifically limits further use and disclosure other than for the identified purposes of collection "except as authorized or required by law"; third party monitoring on an annual basis.
Failure to limit retention	• Put the resources in place and develop an overall records retention policy for the FSC Program that is consistent with the Municipal Records Authority.
Incomplete/data/inaccurate information	• Ensure that from a policy/protocol perspective that staff involved in project are reminded to verify and update client information; scheduled reminders for users to confirm information.

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Data breach/inadequate safeguards leading to identification of residents and related risks including lack/loss of trust	• Follow Privacy by Design Principles. • Establish privacy and security infrastructure that incorporates what privacy and security features are required to ensure that personal information is protected relative to its sensitivity and vulnerability (+ server integrity/data back-ups). • Establish and follow privacy framework including all protocols & policies noted in PPIA; security audits; conduct full privacy impact assessment.
Failure to be open and transparent about management of personal information	• Continue the openness and transparency philosophy adopted for this initiative by ensuring that privacy features of the program are promulgated successfully through websites and open forums.
Failure to provide individuals access to their own information	• Establish and promulgate procedures on web sites and other communication venues whereby individual citizens are informed of how they may obtain their own personal information that the organization holds on them.
Failure to communicate clearly about how to challenge compliance	• Publish openly to whom and how individuals may complain about their privacy rights being compromised.

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Implementation Phase Requirements

We have identified that the primary legislative requirements that relate to our projects relate to privacy (detailed in *Data and Privacy.*)

We recognize the **Duty to Consult** with First Nations on a broad range of issues. A key motivator for the City of Fredericton and St. Mary's First Nation to submit a joint proposal was to develop a closer relationship between our neighbouring communities. This process is the launching point for pursuing a Friendship Accord that will set a framework of governance and collaboration and establish processes for consultation for this and other initiatives of shared interest. The projects in this proposal are governed by the Smart Cities Task Force, which includes representatives from both the City of Fredericton and St. Mary's First Nation.

We recognize the **Community Employment Benefits (CEB)** initiative is designed to provide employment and/or procurement opportunities for: apprentices; Indigenous peoples; women; persons with disabilities; veterans; youth; recent immigrants; and small-medium-sized social enterprises.

As part of our vision to become a more inclusive, connected community supporting diversity, we will be participating in the CEB with respect to the following target groups:

- **Youth / Indigenous Peoples** – Appdigenous has committed to giving preference to qualified candidates who are chronically economically disadvantaged including, in particular, young indigenous individuals. Through this project – starting the summer of 2019 – six indigenous students and one project coordinator will be hired to undertake a research study to determine the number of wheelchair push button doors in Fredericton. Doorable will also partner with the Joint Economic Development Initiative (JEDI) to hire indigenous students for the programming and product development.
- **Small to Medium-Sized Social Enterprises** – Through Digital Fredericton's 'Connected Community' layer and the Digital Community Hub, citizens and entrepreneurs will be able to access open data to designs solutions to address community problems. As part of the Digital Fredericton project funding, we intend to procure and invest in new apps / startup companies to fuel procurement and more products from startups like Doorable, which will lead to job creation.
- **Women** – As part of our efforts to support social SMEs, an emphasis will be put on targeting and supporting female entrepreneurs. Already, Fredericton and St. Mary's First Nation have set the stage by supporting Melissa Lunney, Doorable Founder.

As part of the Smart Cities Challenge requirements, it is understood that specific CEB targets and a community employment benefits approach will need to be established when project funding is awarded.

Although the nature of the projects included in this proposal would suggest that a **Climate Lens Assessment** is not necessarily applicable, we have identified a potential for environmental issues to be addressed through future potential projects based on the

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insights we develop on what matters most to residents. Some digital tools may be developed to have a positive environmental impact (e.g. to increase renewable energy use, recycling, reduce greenhouse gas emissions, etc.) In developing the IoT network, we are deploying urban sensors to monitor environmental conditions, such as flooding, air quality and localized weather conditions. Generating this data will allow us to engage the community in environmental solutions and identify how we can adapt to climate change and minimize our environmental footprint.

Implementation Phase Risks and Planned Mitigations

Risk	**Mitigation**
Traditional procurement processes used do not consider the opportunities presented by the Community Employment Benefits initiative.	The governance structure provides direct control over initiatives that impact procurement and the task force will be advised of the objectives of the CEB and provide governance over its implementation.
Failure to adequately consult First Nations	Implement Friendship accord to provide a governance structure for systematic oversight of issues of mutual interest.

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Financial

Comprehensive Project Budget

Revenue Including Own-Source and Partner Contributions

Funding	2019	2020	2021	2022	2023	Total
Own Source Revenue						
City of Fredericton Capital Budget for Digital Fredericton Core Systems	$ 1,040	$ 500	$ 500	$ 500	$ 500	$ 3,040
City of Fredericton Capital Budget for IoT sensors and new use cases	-	25	25	25	-	75
City of Fredericton Operating Funds - Staff Salaries for Smart Cities	150	150	150	150	150	750
City of Fredericton - IT Investments in New Cybersecurity	100	100	100	100	100	500
e-Novations Comnet Inc. - Investment in free community WIFI	375	-				375
	1,665	775	775	775	750	4,740
Direct Partner Contributions						
Confidential partner In-kind Investment in Innovation and data connections	100	100	100			300
ESRI - In-kind professional services contribution for Digital Community Hub	20	20	20	20	20	100
	120	120	120	20	20	400
Infrastructure Canada - Milestone Outcomes Based Payment	1,925	3,320	1,895	1,480	1,380	10,000
Total Funding	$ 3,710	$ 4,215	$ 2,790	$ 2,275	$ 2,150	$ 15,140

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Expenditures for Outcomes	2019	2020	2021	2022	2023	Total
Digital Fredericton						
Core e-government services						
Utilities and Customer Billing		1,000				1,000
Work Management and Field Service Delivery			1,200			1,200
Digital Talent Strategy	150					150
HR Scheduling		875				875
Talent and Performance Management			1,425			1,425
Citizen Experience Strategy	240					240
Customer Relationship Management / 311 services				1,000	1,000	2,000
	390	1,875	2,625	1,000	1,000	6,890
Customer Experience Strategy						
Ethnographic Research (2 segments per year)		50	50	100	50	250
First Nations specific ethnographic research (2 segments - directed by SMFI	50	50	50			150
Idea creation and user centred prototype design from ethnography insights	20	20	20	20	20	100
Digital Inclusion Tools application and technology development and innovat	125	250	-	250	125	750
Fist Nations specific digital tools resulting from ethnography			250	-		250
	195	370	370	370	195	1,500
NPO data collaboration						
Establish core systems and digital processes and acquire resources and talen	140					140
On-board early adopters		215				215
Build capacity and share data			175			175
Expand project and build data analysis capacity				175		175
Link data & connect aggregate data to Dashboard Community Hub					175	175
	140	215	175	175	175	880
Road Home						
Initialize digital core systems for shared client intake and case management						
Build Digital Inclusion Infrastructure and provide user technology	60	-	4	4		68
Provide technology resources for First Nations shelter	30		1	1		32
Upgrade free Public WIFI in Downtown Public Spaces and on Transit Buses	300	-				300
Create personalized digital inclusion tools - "Digital Street Guide"		125				125
	390	125	5	5	-	525

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	2019	2020	2021	2022	2023	Total
Doorable						
Application and hardware development and technology platform	315	102				417
Deploy hardware and software	190	85	55			330
Map accessible City	135					135
Create "Doorable" on-line community		80	173			253
Integrate IoT parking sensor data to application			15			15
	640	267	243	-	-	1,150
Dashboard, Digital Community Hub						
Project mobilization with Data Analyst, Digital Community Hub Coordinator	345					345
Technology procurement and platform development	60	60	60	15	10	205
Build content and create user base						-
Release #1 - Accessible & Supportive		210				210
Release #2 - Cultural Connectedness			245			245
Release #3 - Economic Inclusion & Dashboard				245		245
Release #4 - NPO and Community Hub					280	280
	405	270	305	260	290	1,530
Transformation Management						
Transformation and communications team consulting services	350	130	130	130	130	870
Privacy Officer (Virtual Privacy Officer - Annual Review)	20	15	15	15	15	80
Smart Cities innovation lab space	10	20	20	20	20	90
SMFN dedicated lead for ethnography and technology initiatives	75	75	75	75	75	375
Project Management - City Staff Dedicated to project	150	150	150	150	150	750
Cybersecurity (Virtual CISO and Security Operations Monitoring)	100	100	100	100	100	500
	705	490	490	490	490	2,665
	2,865	3,612	4,213	2,300	2,150	15,140
Cashflow	*845*	*603*	*- 1,423*	*- 25*	-	-

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Contributions from Other Sources

As outlined above in the comprehensive budget, the City of Fredericton will directly contribute $3.1 million in capital funding, along with $1.25 million in operating funds for dedicated staff salaries and increased operating investments in cybersecurity.

The City's wholly owned subsidiary, e-Novations Comnet Inc. plans to contribute $375,000 towards community digital infrastructure that will directly benefit this Smart Cities journey.

Our technology partners have also committed to in-kind investments of services and expertise:

- Confidential partner, $100,000 per year in-kind investment in innovation
- Eleven-X Inc., half of the cost for the next 1000 connections on our IoT network for the next two years as in-kind contributions. This will total up to $12,000 in connectivity fees.
- Esri Canada Inc., $20,000 per year professional services support of the development of the Digital Community Hub.

Leverage Other Financial Sources

Many of the connected community applications will be developed by third parties as a repeatable business model. Doorable, Hullo and LiveKool each have a planned commercial business model supporting their social technology products. The Smart Cities funding will help seed the ideation, prototyping and preliminary market testing and development of these products.

Having validated the business use case with proven user adoption, many of the third parties will seek investor funding and access other government investment initiatives for technology innovation and business development including:

- The New Brunswick Innovation Foundation (NBIF)
- Atlantic Canada Opportunities Agency (ACAO)
- Opportunities New Brunswick (ONB)
- Business Development Bank of Canada (BDC)

This is not the first time the City of Fredericton has acted in the capacity as early adopter to bring technology innovations to market. The City has partnered with many start-ups including HotSpot Parking and Beauceron Security.

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Working with the City of Fredericton as a first customer, HotSpot Parking was able to understand the problem and test solutions to build a repeatable business process. HotSpot then leveraged their experience and track record with the City to secure private equity funding including investments from NBIF and BDC. HotSpot has also leveraged funding from ACOA to develop and grow a sustainable business model. HotSpot now has over 30 major customers throughout Atlantic Canada and Ontario with 10 full time staff.

> "It would not have been possible to attract funding and investment without the City of Fredericton as our first customer. The City shared their expertise to help us understand the problem and allowed us to test our prototypes and build a repeatable business model. This in-kind investment and direct access allowed us create a business from which to attract significant public and private investment"
>
> **Phillip Curley | CEO, HotSpot Parking**

Financial Tools and Accounting Methodologies

The project will use traditional job cost reporting with monthly cashflow management to monitor and control project revenues and expenditures.

Accounting for the project will be handled within the City's financial accounting system and by the City's finance department and accounting staff. The overall project will be assigned a unique cost centre within the City's financial system and each of the project streams will be assigned a project job code within that cost centre.

All expenditures related to the project will be coded to the cost centre and project job code. The comprehensive budget will be further broken down into planned monthly cash-flows. As part of the City's regular reporting process, the actual expenditures by job will be compared with the planned cashflow monthly. Any variance greater than $1,000 or 5% will be investigated as to the cause, and planned spending remaining to year end will be re-evaluated.

These two methods follow established processes on existing systems with experienced personnel and allow for detailed tracking and proactive course adjustments. The process is controlled within existing internal controls and has Council oversight.

Procurement will be subject to the New Brunswick Public Purchasing Act. Procurement will use the City's purchasing agents and established policies and financial systems.

Because Smart Cities funding is outcome-based using predetermined milestones, the City will provide upfront cash-flow requirements using own source revenues committed to this project. Early milestones have been set that allow for the project to be cashflow positive using this combination of City annual funding commitments and outcome-based payments.

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Where funding is allocated specifically for staffing through St. Mary's First Nation and other activities under the direction and control of St. Mary's, these payments will be made semi-annually in advance to St. Mary's for disbursement within those established management systems.

Methods, Sources, and Assumptions Used for Estimating Costs

We use several sources and methods to estimate costs:

1. **Wherever possible we used experience from similar recent projects to estimate the cost of initiatives in this project plan.**

   Our estimates for Customer Experience Strategy, ethnographic research, and user-centred design are based on the cost of our finalist phase pilots of ethnographic research and user-centred design workshops. Each were conducted by professional consultants and costs for the scope of these activities are proven.

   Throughout the finalist phase, we have also worked with Doorable to develop a complete functional version of the software application. The application was created by our ecosystem partner at BlueSpurs on the AWS serverless development platform as outlined in our technology strategy. Through this process of development, we can reasonably estimate the costs to develop other version 1 Digital Inclusion Tools.

   We also worked with Esri to develop several features and functions of the Digital Community Hub. Our estimates for future development are provided by Esri and based on their clear understanding of our goals, and the amount of in-kind professional services taken to develop the prototypes.

   We have experience delivering other key elements of our proposal including core government systems as outlined below.

2. **Industry standard cost estimates, primarily for human resource costs.**

   Several of the estimated costs are for additional human resources to fill strategic roles in the development of Smart Cities data, digital content creation, analysis and administration. The costs of these positions are estimated from industry standard salary scales for these types of human resources.

3. **Cost estimates from vendors for specific items contained in this proposal.**

   In building our cost estimates for core e-government services we have received cost estimates from our strategic partners at Deloitte and Oracle. These cost estimates are based on both on our recent experience implementing core financial and HR systems at the City of Fredericton, and also from their knowledge base of similar projects deployed by their teams.

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4. **We use agile development to minimize financial risks, fix total costs upfront and manage project to budget.**

   In order to minimize financial risk, we will use an agile approach to projects. This method helps to establish project estimates and resources first then work progresses in short sprints to develop, test, and implement solutions iteratively.

   Using an agile approach involves focusing on shorter "sprints" with targeted functionality, allowing teams to develop prototypes to confirm requirements when needed. Consistent reviews by management are conducted at the end of each Sprint. This means issues will surface early and can be addressed immediately. When functionality is accepted by users it can be deployed. Because agile involves a process focus, it removes silos between teams and brings together all groups involved.

   We chose an agile approach because:

   - It allows **quicker delivery**, which can decrease the cost and accelerate the achievement of desired outcomes.
   - It helps **build strong relationships** to fully understand current pain points to ensure both the technology and the people are ready for the digital transformation.
   - It enables **accelerated delivery of high-priority features** and opportunities at regular intervals throughout the engagement for leaders and stakeholders to view demonstrations of key processes in the system.
   - It enables **faster adoption** with increased knowledge transfer throughout engagement delivery.
   - It enables **increased transparency and feedback**, offering opportunities for leaders and stakeholders to give input to the solution and identify issues as they arise.
   - It allows for more **predictable costs** and allows for course corrections early.

5. **We use detailed cost breakdowns of project subcomponents to estimate total cost and match them with milestones.**

   The detailed breakdowns of smaller project sub-components and intermediate steps allow for much more accurate costing of the overall project plan.

   The following pages contain the detailed breakdown of costs by project area. These detailed breakdowns are the basis for cost estimations and used for preparing monthly cash-flow projections by project.

   Together these techniques provide effective and consistent controls over budget and scope and provide routine opportunities for evaluation and course correction.

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Financial Risks and Planned Mitigations

Risk	Mitigation
Cost and budget overruns	Use detailed cost breakdowns with monthly monitoring against planned annual cashflows for budget control. Use agile development to set project cost and build most important features first using iterative development to control project costs.
Procurement delays and red tape	Engage purchasing agents early in the process to advertise expression of interest calls to establish a pool of preselected partners.
Additional cost of administrative overhead	Use existing process and procedures and existing accounting systems to minimize creation of new reporting, controlling and administrative functions.
Lack of internal controls over external organizations	Where possible, have all expenditures paid through existing City finance and administrative controls. Where external agencies disburse funding directly, provide payments in installments and report on payments and monitor outcomes of projects through the Task Force Governance structure.
Cash-flow requirements due to outcomes-based payments	Seed projects with own source revenues enough to generate early proven deliverables, and track performance measures using progress to ultimate outcomes with earlier stage gates.
Financial burden of expenditures that fail to produce outcomes and trigger payments	Use performance measure that are broken down into early indicators of success to reduce the time between costs and evaluation of success. Provide written roles and responsibilities of the Task Force that outline their role to detect early failures and advise course corrections. Ensure that the Task Force is functioning effectively to receive and evaluate quarterly reports and has clear mandate to seek remediation and course correction.
Financial impact of cybersecurity or privacy breach	Use routine threat risk assessment, threat hunting and cyber security monitoring to reduce risks, and use annual privacy review to identify potential problems before they occur. Assess the need for cyber and privacy insurance to insurance against the financial risks from breaches.
Escalating pace of technology change that results in investments in outdated solutions	Use loosely coupled solutions in a service-oriented manner so continued development can occur even of not all requirements are known at the onset. Taking an Agile approach to solution development will also facilitate extensibility among technologies both current and future.

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Project Costs with Timelines

Road Home

Phase	Phase Duration	Milestone	Milestone Date	Cost Breakdown
HIFIS4 Deployment	Ongoing	HIFIS Coordinator		In-Kind
	Sept-Nov/19	Onboard 5 agencies: (Fredericton Homeless Shelters Inc., John Howard Society of Fredericton, Capital Region Mental Health & Addictions, Youth in Transition, Liberty Lane)	Dec 1/18	
	Jan1-Mar 1/19	Complete data transfer from HIFIS3 to HIFIS4	Mar 1/19	grant
Training	Feb1-July 1/19	Create training capacity for HIFIS, SPDAT (train the trainers) & develop user manual	July 1/19?	grant
Technology	July 1-Nov 1/19	Deploy digital infrastructure/user tech to agencies above (fibre, hardware/software, licensing)	July 1/19	$60,000
	2019	Upgrade free public WiFi	2019	$150,000
Service Coordination	July1/19-July1/20	Onboard 3 additional agencies & coordinate services (St. Mary's First Nation shelter, Gignoo, Women in Transition)	July 1/20	
Technology	July 1-Nov 1/20	Deploy digital infrastructure (fibre, hardware, licensing) – First Nations shelter	July 1/20	$30,000
	2020	Upgrade free public WiFi	2020	$150,000
Service Coordination	July1/20-July1/21	Onboard 1 additional agency & coordinate services: - Fredericton Downtown Health Clinic	July 1/21	
	Feb 1/19-July1/21	Coordinate intake & assessment & triage model among 9 agencies, identify opportunities for improvement (OFIs)	July 1/21	
Technology		Digital inclusion infrastructure & tech resources (First Nations)	July 2/21	$4,000 $1,000
App Development	July 1/19-April1/21	Create personalized digital inclusion applications/tools (i.e. digitized street survival guide)	April 1/21	$125,000
Digital Community Hub	Aug 1/20-April 1/21	Coordinate high level aggregate data based on indicators to 'city performance dashboard' and personal level resources	April 1/21	
Technology		Digital inclusion infrastructure & tech resources (First Nations)	July 1/22	$4,000 $1,000
Sustainability Plan		Coordinate plan among agencies.	2023	
Total				$525,000

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Non-Profit Data Collaboration

#	Phase	Phase Duration	Milestone	Milestone Date	Cost Breakdown
	Admin-HR	July1/19–Mar31/20	Recruit, hire, orientate 3 staff • Project Manager (GFSI) • Process design consultant (GFSI) • Data analyst (IRDT) Develop communication/ engagement plan	July 1, 2019	$ 140,000
Loop 1 – early adopters	Project Management: process design, data-sharing agreements & onboarding	April 1/20 – Mar 31/21	• Privacy and data sharing agreements signed with 10-NPOs • Project protocols and organizational targets refined and approved • data management assets and practices of 10 NPOs mapped • 10 NPOs trained in in-house data analysis • Phase 1 of process tool-kit developed	April 1/20	$ 100,000 (GFSI)
	Data security & Privacy Standards	April 1/20-Mar 31/21	• 10 NPOs privacy impact assessments completed, common data standards defined • data sharing agreements created and signed • 10 NPOs privacy and ethics compliance completed	April 1/20	$ 80,000 (IRDT)
	Build NPO capacity	April 1/20-Mar 31/1	• data sharing agreements signed • privacy/confidentiality guidelines/templates implemented • trained to link/analyze/explore in-house data • NPO successes and gaps identified		$ 15,000 (NPO)
	United Way & Fredericton Community Foundation	July 1/19 – Mar 31/20	• Creation/updated online funding applications with new data standards • Consulted with partner agencies	Mar 21/20	$ 20,000 (UW & FCF)
Loop 2	Project Management: data-sharing agreements, onboarding 10 new Agencies	April 1/21 – Mar 31/22	• onboarded 10 new agencies • privacy and data sharing agreements signed • project protocols and organizational targets develop and approved • data management assets and practices mapped • 10 NPOs trained in data analysis • Testimonials and case studies from NPOs of improvements made based on data • Process tool-kit completed	April 1/21	$ 80,000 (GFSI)
Loop 2	Data Security & Privacy Standards	April 1/21-Mar 31/22	• 10 NPOs privacy impact assessments completed, common data standards defined • 10 NPOs privacy and ethics compliance • data transferred to IRDT • de-identify and data cleaning • NPO data aggregated and anonymize to the community level • link data to GNB data portals & Digital Community Hub	April 1 /21	$ 80,000 (IRDT)
Loop 2	Build NPO capacity	April 1/21-Mar 31/22	• data sharing agreements signed	April 1/21	$ 15,000 (NPO)

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			• privacy/confidentiality guidelines/templates implemented • trained to analyze/explore in-house data • trained to analyze/explore community-level data • NPO successes and gaps identified		
Loop 3	Project Management: data-sharing agreements, onboarding	April 1/22 – Mar 31/23	• privacy and data sharing agreements signed with 10-NPOs • data management assets and practices mapped • trained 10 NPOs on data analysis	April 1/22	$ 80,000 (GFSI)
Loop 3	Data security, Linking, & Privacy Standards	April 1/22- Mar 31/23	• 10 NPOs privacy impact assessments completed, common data standards defined • Testimonials and case studies from NPOs of improvements made based on data • 10 NPOs Privacy and ethics compliance • transfer data to IRDT • de-identify and data cleaning • NPO data aggregated and anonymize to the community level • link data to GNB data portals & Digital Community Hub	April 1/22	$ 80,000 (IRDT)
Loop 3	NPO Capacity Building	April 1/22- Mar 31/23	• data sharing agreements signed • Privacy/confidentiality guidelines/templates implemented • train to analyze/explore in-house data • train to analyze/explore community-level data • NPO successes and gaps identified	April 1/22	$ 15,000 (NPO)
Loop 4	Project Management: data-sharing agreements, onboarding	April 1/23 – Mar 31/24	• privacy and data sharing agreements signed with 10-NPOs • develop and sign off on project protocols and organizational targets • trained 10 NPOs on data analysis • data management assets and practices mapped • testimonials and case studies from NPOs of improvements made based on data	April 1/23	$ 80,000 (GFSI)
Loop 4	Data Security & Privacy Standards	April 1/23- Mar 31/24	• 10 NPOs privacy impact assessments completed, common data standards defined • 10 NPOs Privacy and ethics compliance • transfer data to IRDT • de-identify and data cleaning • NPO data aggregated and anonymize to the community level • link data to GNB data portals & Digital Community Hub	April 1/23	$ 80,000 (IRDT)
Loop 4	NPO Capacity Building	April 1/23- Mar 31/24	• data sharing agreements signed • privacy/confidentiality guidelines/templates implemented • train to analyze/explore in-house data • train to analyze/explore community-level data • NPO successes and gaps identified	April 1/23	$ 15,000 (NPO)
	Total				$879,000

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Digital Fredericton

Agile approach with Sprint outline.

#	Phase	Phase Duration	Milestone	Milestone Date	Cost Breakdown
1	Work Management & Field Service Delivery				
	July 1/19-Feb 7/20 (30 wks)	Prework (2 wks)	• Product selection finalized • Product licensing (annual) • Internal team identification		$50,000
		(4 wks)	• Develop workplan • Create status report templates • Develop instance & integration strategy • Develop test strategy • Develop high level change management plan • Confirm user stories		$150,000
		Sprint 1 Sprint 1 Spring 2 (4 wks)	• Project financials • Project costing • Inventory		$200,000
		Sprint 3 (4 wks)	• Field service core manage cloud & field service mobility cloud • Maintenance management		$150,000
		Sprint 4 (4 wks)	• Field service customer communication & field service routing • Smart location cloud		$150,000
		Testing (4 wks)	• Systems integration testing & user acceptance testing		$150,000
		Deploy (4 wks)	• Process redesign & capability development		$150,000
		Deploy (4 wks)	• Product cutover/support & transition		$100,000
	Phase 1 Sub-total				$1,200,000
2	Utilities & Customer Billing				
	July 1-Dec 20/19 (25 wks)	Prework (2 wks)	• Product selection finalized • Product licensing (annual) • Internal team identification		$100,000
		Sprint 0 (2 wks)	• Develop workplan • Create status report templates • Develop instance & integration strategy • Develop test strategy • Develop high level change management plan • Confirm user stories		$50,000
		Sprint 1 (3 wks)	• Accounts receivable • Contracts cloud service • Development		$300,000
		Sprint 2 (3 wks)	• Order management cloud		$125,000
		Sprint 3 (3 wks)	• Advanced collections		$125,000

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		Testing (4 wks)	• Systems integration testing • User acceptance testing		$100,000
		Deploy (4 wks)	• Process redesign & capability development		$150,000
		Deploy (4 wks)	• Product cutover/support/ transition		$50,000
	Phase 2 Sub-total:				$1,000,000
3	Talent & Performance Management				
	July 1/21-Feb 11/22 approx. (30 wks)	Prework (4 wks)	• Product selection finalized • Product licensing (annual) • Internal team identification		$50,000
		Sprint 0 (2 wks)	• Develop workplan • Create status report templates • Develop instance & integration strategy • Develop test strategy • Develop high level change management plan • Confirm user stories		$100,000
		Sprint 1 (4 wks)	• Talent acquisition • Succession management		$250,000
		Sprint 2 (4 wks)	• Learning cloud service		$250,000
		Sprint 3 (4 wks)	• Performance management		$250,000
		Testing (4 wks)	• Systems Integration testing • User acceptance testing		$250,000
		Deploy (4 wks)	• Process redesign & capability development		$150,000
		Deploy (4 wks)	• Product cutover/support/ transition		$125,000
	Phase 3 Sub-total				$1,425,000
4	CRM/Portal				
	July 1/20-Aug/21 (56 wks)	Prework (4 wks)	• Product selection finalized • Product licensing (annual) • Internal team identification		$400,000
		Sprint 0 (8 wks)	• Develop workplan • Create status report templates • Develop instance & integration strategy • Develop test strategy • Develop high level change management plan • Confirm user stories		$400,000
		9 sprints (4 wks/sprint x9 sprints=36 wks)	• Citizen portal • Enterprise contact center • Interface cloud service		$900,000 $100,000/sprint)
		Testing (4 wks)	• Systems Integration testing • User acceptance testing		$200,000
		Deploy (4 wks)	• Product cutover/support/ transition		$100,000
	Phase 4 Sub-total				$2,000,000

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5	Customer Experience Strategy (cycle repeated annual: ethnography, insights, ideation, prototyping, tools)				
	July 1/19-July 1/23	2019	• Citizen experience strategy		$ 240,000
		2021 2022 2023	• Ethnography research (2 segments per year)		$100,000 $100,000 $100,000
		2019 2020	• First Nations specific ethnographic research (2 segments directed by SMFN)		$50,000 $50,000
		annually	• Ideation & prototyping based on insights		$20,000/year =$100,000
		2019 2020 2021 2022 2023	• Digital inclusion tools, application/tech development and innovation		$125,000 $250,000 $125,000 $125,000 $125,000
		2021 2022	• First Nations specific digital tools resulting from ethnography		$125,000 $125,000
	Phase 5 Sub-total:				$1,740,000
6	Digital Talent Strategy				
	July 1-Sept 18/20 (12 wks)	Sprint 1 (8 wks)	• Digital employee talent proposition • Define • Skills identification • Skills gap		$100,000
		Sprint 2 (4 wks)	• Talent modelling • Governance		$50,000
	Phase 7 Sub-total:				$150,000
7	HR Scheduling				
	July 1-Dec 24/20 (26 wks)	Prework (2 wks)	• Product selection finalized • Product licensing (annual) • Internal team identification		$150,000
		Sprint 0 (2 wks)	• Develop workplan • Create status report templates • Develop instance & integration strategy • Develop test strategy • Develop high level change management plan • Confirm user stories		$50,000
		Sprint 1-3 (6 wks)	Scheduling		$375,000
		Testing (4 wks)	• Systems Integration testing • User acceptance testing		$100,000
		Deploy (4 wks)	• Process redesign & capability development		$150,000
		Deploy (4 wks)	• Product cutover/support/ transition		$50,000
	Phase 8 Sub-total:				$875,000

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Transformation Management

	Smart Cities Program				
	Digital Fredericton TMO Marketing/communications, & Consulting	2019 2020 2021 2022 2023			$325,000 $125,000 $125,000 $125,000 $125,000
		annual	• Virtual Privacy officer		$20,000 $15,000 $15,000 $15,000 $15,000
		2019 2020 2021 2022 2023	• Smart cities collaboration space		$10,000 $20,000 $20,000 $20,000 $20,000
		annual	• SMFN lead for ethnography and tech initiatives		$375,000 ($75,000/year)
		annual	• Smart Cities project management – dedicated staff		$750,000 ($150,000/year)
			• Cybersecurity (virtual Chief Information Security Officer & security operations monitoring)		$500,000 ($100,000/year)
	Sub-total				$2,620,000

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Digital Community Hub

#	Phase	Phase Duration	Milestone	Milestone Date	Cost Breakdown
1	Project Mobilization Admin-HR	July 1-Aug 1/19 Aug 1-31	Develop skill requirements and advertise posting (2 weeks) for data analyst, digital community hub coordinator, content creator Screen, interview candidates, select/sign contracts and set start dates (Oct 1 latest).	Aug 1/19	$345,000
	Admin-Technology Procurement	July 1-Sept 1/19	Develop RFP package, tender/award project for platform development.	Sept 1/19	$60,000
2	Platform Development	Sept 15/19-Feb 15/20	Develop Digital Community Hub platform ensuring compliance with data & security requirements (conduct user testing where required) for: 1. Smart City Dashboard 3. Personal Digital Inclusion	Feb 15/19	
3	Data Sharing Agreements	Oct 1-Nov 1	Sign 5 partnership agreements (Ability NB, Age Friendly Committee, CAGH, Appdigenous, NB-IRDT)	Nov 1/19	
4	Ethnography, Data Input & Testing	Aug 1-Oct 1/19	Via Digital Fredericton – conduct ethnographic research for 2 segments	Oct 1/19	
		Oct 1-Dec 1/19	Collect & input segment baseline data for dashboards	Dec 1/19	
		Early Feb/20	Pilot /user-centred design testing for 3 segments	Feb 19/20	
3	Data Sharing Agreements	Nov 1/19-Feb 1/20	Sign 5 data sharing agreements: TBA	Feb 1/20	
5	Release #1	Feb 19-Mar 31/20	Develop/deploy communications campaign / launch dashboard. Personal/2 segments +performance: • older adults community hub + integrate LiveKool • accessibility challenged (accessible community hub w/ data & map) • Smart City Performance Level • First Nations segment	April 1/20	$245,000
6	Data Renewal Process	April 1-June1/20	Create process for data refinement and identification	June 1/20	
2	Platform Development	Feb 19-Sept 1/20	Develop dashboard platform for Personal Interactive Level	Sept 1/20	$60,000
7	Census 1		Establish 1,000 users / annual survey / produce community census	Nov 1/20	
4	Ethnography, Design Testing & Data Input	Aug 1/20-Feb 19/21	2 segments + 1 SMFN segment	Feb 19/21	
5	Release #2	Feb 19-Mar 31/21	Personal/3 segments + interactive: • Road home community hub (homeless segment including digital street guide) • Cultural /Newcomers community hub + integrate Hullo	April 1/21	$245,000

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			• SMFN • +Personal interactive level		
2	Platform Development	Feb 19—Sept 1/21	Develop dashboard platform for Organizational Level	Sept 1/21	$60,000
4	Ethnography, Design Testing & Data Input	Aug 1/21-Feb 19/22	2 segments + SMFN	Feb 19/22	
2	Platform Development	Feb 19-Sept 1/22	Develop dashboard platform for Organizational Level	Sept 1/22	$15,000
7	Census 2		Establish 2,000 users / annual survey for community census	Nov 1/21	
5	Release #3	Feb 19-Mar 31/22	Personal/3 segments (TBA) +community hub of interest and integrate user experience tech, applications and data	April 1/22	$245,000
4	Ethnography, Design Testing & Data Input	Aug 1/22-Feb 19/23	2 segments + SMFN	Feb 19/23	
7	Census 3		Establish 5,000 users / annual survey / produce community census	Nov 1/22	
5	Release #4	Feb 19-Mar 31/23	Personal Level – 3 segments + organizational level	April 1/23	
4	Ethnography, Design testing & Data Input	Aug 1-Dec 1/23	2 segments + SMFN	Dec 1/23	
7	Census 4		Establish 10,000 users / annual survey / produce community census	Nov 1/23	$245,000
2	Platform Development		Continued dashboard development for sustainability	Sept 1/23	$10,000
8	Sustainability		Create project sustainability plan		
					$1,530,000

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Doorable

Phase	Phase Duration	Milestone	Cost Breakdown	Milestone Date
Mgt Team & Talent Acquisition	Feb 15-July 15/19	*Mgt team currently in place. Recruit technical staff, installers, CRM staff		July 15/19
Testbed of Users Created	Feb 15-June 30/19	250 downloads of Doorable app. Ver1.0		June 30/19
Sustainability Plan (See Attachment)	Feb 15-Dec 31/19	The Smart Cities funding, which in effect subsidizes 1000 installs of Doorable tech, generates sufficient revenue to undertake the development and growth of the technology as described in the budget. Costs unmet by the launch project are met by install purchases from organizations and businesses as well as through services offered to subscribers.		Dec 31/19 ("Sold" installs and subscriber services)
Research Strategy: Baseline Fredericton	May 6-Oct 11/19	Conduct inventory of all button accessible doors in Fredericton, and make available via Hub	$135,000	Oct 11/19
Commercial Subscribers Testbed (subsidized installs)	May 19-Sept30/19	Sign 5 commercial customers and install hardware (testers) Private sector subscriber consultative group established		June 30/19
Intellectual Property	June 1-Aug 30/19	Develop patentable design schematics on DOORABLE hardware (Release 2)		Aug 30/19
Hardware Development: Web-based Black Box (Version 2) & Testing	June 1-Aug 30/19	Develop Version 2 of Doorable hardware with both wireless and internet connectivity allowing Doorable Release 2 of the User App to be a web capable (future proofing the hardware)	$92,000	Aug 30/19
Mobile application design and implementation: Installer application version 1	July 1-Aug 30,19	Develop Installer App to populate Data base of "Doorable" accessible doors on the "back end" and initialize device	$35,000	Aug 30/19
Advisory Board	July 3-Aug 3/19	Constitute advisory board		Aug 3/19
SaaS Model	Aug 1-Dec 31/19	Create pricing structure for basic level of content management associated with Subscriber app.		Dec 31/19
Public Building Retrofits (Phase 1)	Sept 1-July 1/19	Fit all public buildings owned/ operated by Fredericton/St. Mary's with Doorable technology (HW Release 2)	$150,000	July 1/20
Non-Profits-Retrofit Installations (Phase 2)	Sept 1-Oct 15/19	Fit NPOs participating in Smart Cities Proposal with Doorable (HW Release 2)		Oct 15/19
Hardware Upgrades in Test Sites	Sept 1-Oct 30/19	Conduct testing at Bluetooth enabled door (by Aug/19, the future proofed web capable units will be ready)	$150,000	Oct 30/19
Commercialization/ Market Entry Strategy		(See Appendix - Business Model)		
User Education & Awareness Campaign	Ongoing	Enable online support of user community		July 15/19

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Software (backend cloud server-data storage)	Sept 1-Nov 1/19	Develop back end software to support User App and Version 2 of Firmware	$38,000	Nov 1, 2019
Mobile Application Design & Implementation: User Application Version 1.1	Sept 1-Nov 30/19	Release Version 1.1 (release 2) to User group.	$40,000	Dec 13/19 Release date
Research Strategy: User Experience	Sept 1 – Nov 30/19	Create set of revisions driven by user experience		Nov 30/19
Mobile Application Design & Implementation: Subscriber Application Version 1	Sept1/19-Jan 24/20	Release #1 Subscriber App including content management and push features.	$85,000	Jan 24/20
User Feedback System	Nov 16-Dec 13/19	Build integrated feedback system into User App and Subscriber App.		Dec 13/19
Doorable Community: Online user-user dialogue/community building	Mar31/20-Mar 1/21	Fully develop platform for user-user, user-subscriber dialogue on issues, projects, specific issue-based initiatives, project building.	$172,500	Mar 1/21
Market Research – Subscriber Community	June1-Sept 1/20		$80,000	Sept 1 /20
Mobile Application Design & Implementation: Subscriber Application Version 2	June 1-Dec 1/20	Fully develop platform for services to subscribers, including a fee for service model for content management, push services for interested users and a range of content offerings. Licensing options may be available and developed for large subscribers (i.e. GNB)	$60,000	Dec 1/20
Mobile Application Design & Implementation: User Application Version 2.0	Nov 1/20-Mar 1/21	Major release of the User app synchronized with the release of Doorable Community.	$55,000	Mar 1/21
Data storage and processing	Sept 1/20	Data storage and processing of subscriber data, Open data and User special research data	$42,500	Sept 1/20
10,000 Users	Nov30/20	10% of Greater Fredericton residents		Nov 30/20
MRR SaaS: Fully featured Subscriber services	Dec 1/20-Ongoing	Develop subscriber app features, test/price/deploy		Dec 31/20
20,000 Users	Mar31/21	20% of Greater Fredericton residents		Mar 31/21
New Market Entries: - 2 new NB cities - 2nd province	Mar31/21-Mar31/22			Mar 31/22
60,000 users		Definable percentage of population market in 2 NB cities		Mar 31/22
120,000 users		Definable percentage of population market in 2nd province adopting the technology		Mar 31/23
National Reach	Mar31/22-Mar 31/23	Distribute/sell fully deployed and tested Doorable technology		Mar 31/23
Total			**$1,135,000**	

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Smart Cities Challenge Proposal

March 5, 2019
Akwesasne Submission

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AKWESASNE MOHAWK COUNCIL RESOLUTION

File Reference:

MCR #: 2018/2019 #346

THE	MOHAWK COUNCIL OF AKWESASNE
AGENCY	SOUTHERN ONTARIO DISTRICT
PROVINCE	ONTARIO/QUEBEC
PLACE	Administration 1 Building
DATE	4 (Day) March (Month) 2019 (Year)

THIS MEETING TOOK PLACE IN THE TERRITORY OF AKWESASNE WITH THE FOLLOWING MEMBERS OF THE AKWESASNE MOHAWK COUNCIL PRESIDING

RECORDED VOTE

For: 9

Against: 0

Abstention:

☒ Carried ☐ Denied

DO HEREBY RESOLVE:

Moved: Tim Thompson

Seconded: Theresa Jacobs

WHEREAS, *the Mohawks of Akwesasne have the existing and inherent right of* ***self-determination,*** *which includes the inherent jurisdiction over their lands, peoples and territory;*

AND WHEREAS, *the Mohawks of Akwesasne have the aboriginal and treaty rights, and other rights and freedoms that are recognized and affirmed in the Constitution of Canada, which include the inherent right of* ***self-determination*** *and jurisdiction over their lands, peoples and territory;*

AND WHEREAS, *the Mohawk Council of Akwesasne is the community government within the territory of Akwesasne and has* ***inherent jurisdiction*** *to make laws, regulations and policies to meet the needs and concerns of the Mohawks of Akwesasne;*

AND WHEREAS, *the Mohawk Council of Akwesasne intends to preserve the cultural, political and economic integrity of the Mohawk territory and community of Akwesasne;*

WHEREAS, Infrastructure Canada announced Canada's Smart Cities Challenge in the fall of 2017, which is a competition open to municipalities, local or regional government, and indigenous communities (First Nations, Inuit and Metis) across Canada; and

WHEREAS, the Mohawk Council of Akwesasne (MCA) staff, leadership and technicians discussed the Smart Cities Challenge and worked with a digital consultant on framing the Challenge Statement for submission; and

WHEREAS, Mohawk Council of Akwesasne submitted the finalized challenge statement was selected as a finalist for the Infrastructure Canada Smart Cities Challenge; and

WHEREAS, The Smart Akwesasne Team worked diligently on collecting community input and formulated the criteria for the compilation of the final proposal submission; and

WHEREAS, The final proposal is now complete and has been prepared for submission;

THEREFORE BE IT RESOLVED THAT, The Mohawk Council of Akwesasne approves the final proposal and supports it's submission to Infrastructure Canada for consideration in the Smart Cities Challenge.

CARRIED.

Grand Chief ☐ Yes ☐ No

Chief ☒ Yes ☐ No ☐ Ab | Chief ☒ Yes ☐ No ☐ Ab | Chief ☒ Yes ☐ No ☐ Ab

Chief ☒ Yes ☐ No ☐ Ab | Chief ☒ Yes ☐ No ☐ Ab | Chief ☐ Yes ☐ No ☐ Ab

Chief ☒ Yes ☐ No ☐ Ab | Chief ☒ Yes ☐ No ☐ Ab | Chief ☐ Yes ☐ No ☐ Ab

Chief ☒ Yes ☐ No ☐ Ab | Chief ☒ Yes ☐ No ☐ Ab | Chief ☐ Yes ☐ No ☐ Ab

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Executive Summary

Our Smart Cities Challenge: To reduce the prevalence of new cases of diabetes at Akwesasne to the rate of the Canadian average. Our goal looks rather humble, to only be as bad off as the rest of the Canadian population. With this statement, however, the people of Akwesasne draw a line in the sand against the existential threat of diabetes. And our work maybe beneficial to others: Recent research reviewing 111 studies worldwide confirmed a disproportionate burden of diabetic disease complications among all Indigenous peoples regardless of their geographic location.

(From: Global complication rates of type 2 diabetes in Indigenous peoples: A comprehensive review)

We recognize that the situation Akwesasne folks now face was ultimately caused by our loss of traditional ways. A steamroller of westernization disrupted our traditional lifestyles, polluted our natural food sources, and dropped on top of the Akwesasne territory three complicating political jurisdictions, not of our making. Our skills and competencies in the old ways lost relevance. Our elders' ability to provide guidance using traditional teachings and ceremonies was derailed. The temptation of western consumptive habits and modern food, that is, frankly disease causing exacerbated our genetic susceptibility for diabetes, as did our now overly sedentary lifestyles. Our traditions sought to preserve our unique relationship with the environment, to make us a sustainable society. This has been replaced by our acceptance of living in a negatively altered state, and of accepting the need for modern medicine, which does not bring us back to health. It does not cure but keeps us in a state of perpetual decreased vitality.

But how to reverse this trend towards ever worsening health? How can we address this problem in a new way?

We became aware of how organizations and industries were re-inventing themselves and disrupting their existing situation for the better through the use of Design Thinking. With our partners, we learned how to get to the root of our problem, and how to come up with ideas to solve the problem.

We wanted to have all of our community involved. We wanted to make our work transparent so our residents' relationships with our public organizations and with each other would be stronger. We wanted our people involved so the solutions that are

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designed will work for our people because they were part of developing where we are going at every step.

We started by looking over everything we had previously studied. We brought together our people singly, in groups, and remotely through surveys and phone calls. We discussed and identified problems. We thought of over 100 causes and solutions and then arrived at key insights regarding our predicament. We determined that the precursors leading to high levels of diabetes are related to these rather straightforward factors:

- Food Accessibility
- Network Accessibility
- Transportation Accessibility
- Westernization
- Checkup Frequency in Health and Dental
- Healthcare System Disconnection
- Loss of target demographic following primary school.

(These will be explained in detail later in our proposal).

We learned that the way forward for the health of Akwesasne must be a multipronged approach, working on many battle fronts at the same time. In our own traditions of health we remember from a Haudenosaunee perspective Goodmindedness, Peacefulness, and Strength are synonymous with a unified mind, body, and spirit concept. Similarly, our ability to achieve a healthy state will focus on four pillars that summarize our insights: Wellness, Tradition, Access, and Measurement. These Pillars will become themes for our actions in our Smart Cities approach, and take the form of new tools, and a new way of communicating, remembering and teaching. With the help of technology, the way forward is for us to accurately understand our own condition, organize ourselves for change and then make change happen in measurable, adjustable ways.

In the big picture we are where we are because we could not adapt when westernization and industrial technology changed our environment. This is the same story for Indigenous people the world over and is also a story of misused power. While it is regrettable our current environment offers us much less in many ways then it once did, it also has new things in it. Our elders could walk into the bush and point to dozens of things that had nutritional, medicinal or cultural uses. Now our environment has technologies and machines that we need to recognize as useful and use. And not just use, but develop our own skills in their use.

In the years since we were forced to abandon traditional ways and lost our self-sufficiency, the spirit of our community was also damaged. The disruption to Kanikonhriio or Goodmindedness, and Sken:nen or Peacefulness, led to the loss of our strength in looking after ourselves and each other. It weakened our self-worth, our contribution of shared effort, our access to teachings; all were made difficult. Even food in our own territory can no longer be

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drawn from the river or grown safely.

Yet the strength of our community can be reinvigorated, especially if we tackle the issue of diabetes. We can make use of new technologies such as mobile communication to help us function like a community again. Systems can be introduced that will make us strong together by keeping us in touch, by responding to each others requests for help or to learn; we can share our learnings and join one another in healthy activities, and get to know one another.

Our health challenges are made harder because we don't know one another. Not in the causal sense of knowing but in the sense that our health services don't have proper information on our individual health. The fracturing of our community across jurisdictions and health districts means we can hardly even know ourselves in the sense of having an accurate medical history, often spread across provinces and countries. So how can we understand the health status of our community or plan to improve it? A mobile application, designed for the purposes of organizing us and our information can give us back this glue that can make us a community again. Modern tools can make our problems understandable, and allow us to find insights into our condition so we can develop ways to reverse our maladaptation to this still relatively newly imposed environment.

Now, in thinking about how technology can help Akwesasne, and what the Smart Cities challenge may permit us to accomplish, we started with a new way of thinking as a group. Design Thinking helps organizations innovate, which is really just a word for adapting. And this approach allowed us make up time for those years when we weren't adapting; we wanted to move ahead but had trouble deciding what needed to be done. Now we have gone over what we know, focussed on a challenge, engaged our community, developed some momentum and made a plan that uses smart technologies as an antidote for the issues caused by previous modernization.

Akwesasne has recognized the Smart Cities Challenge as an opportunity to face our hardest challenge. It has brought our community together and we have found a way to organize ourselves to move forward. While much of the world's technology had caused problems for us in the past, we will now use technology as a raw material to regain our vitality.

Our plan for adoption of technology will be on our terms. Our project probably does not seem earth shattering, which is a rate of change we find disconcerting, anyway. Through the use of about a dozen electric vehicles, the construction of 3 greenhouses adopted by the school curriculum, and a mobile application we can put in everyone's hand we plan to attack the 4 pillars of our challenge. With this limited investment in machines and software we will address the insights about our predicament.

Key to organizing the strength of our community will be the mobile and administrative coordination tool we are calling the Akwesasne Community

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Application. This brings everything together by providing communication amongst our people, coordination of services, access to food and community programs, measurement of service efficiency, and tracking of individual health. With these tools and oversight, we will make progress on our challenge, and reduce the rate of new disease to the rate of other Canadians. It would be nice to target the rate of diabetes in our people of 200 years ago, but for now it will be a major goal to achieve the health of other Canadians.

Our success will represent a watershed in our history. This will be where we began to defeat the most significant health risk for our people. This is where we began to improve the most significant factor for achieving a happy life, that being good health. Our elders knew how to make the most of what the environment offered; we can use that approach again. Tech is like a new herb, we must understand and use it. We will put it to use without obliterating the traditions that are our identity. We will use it while maintaining harmony with the environment.

We can use new things like e-cars and e-buses to get where it is important to go, without adding to the toxic load by burning oil. We can use greenhouses to replace our polluted food sources and gain back a measure of self-sufficiency. Mobile and computer programming can bring back the sharing and helping on which our strength as a nation was based. Digital tools will give us access to our collective memory and to the wisdom of our traditions, from which we regain pride necessary for our progress as a people. Our traditional teachings shows how strength is based on things working together. We will use that approach to work on many things at once to reverse the main threat to our health.

We believe this solution is extensible. Our package of ideas, with its mobile technology, databases, integration of health devices, location sensing, health diagnostics, statistics, transportation logistics, electric vehicles — these are all details to be adjusted for each case. At the center, however, will be the open-source system that is the hub of the services, and this is a non-proprietary system suitable for hosting anywhere. What we have learned, the approaches we take, the way we integrate the very new with the old will surely be helpful to aboriginal nations across Canada and the world over.

We are not the only people whose nation has been knocked out of harmony with the environment because of colonialism. We are not the only aboriginals whose communities were disfigured by imposed change and 'progress'. Regardless of cause, other indigenous people around the world are vulnerable to developing diabetes at the rates we are. They would surely benefit from our experience with this project. They would be welcome to our technology.

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Vision

The goal of our Akwesasne Smart Cities Challenge is to leverage smart technologies to reduce new cases of diabetes in Akwesasne to the Canadian national average. Six months ago our preliminary proposal laid out four pillars of focus, and we hold true to that vision in both our process and outcomes. These four pillars are improving approaches to community wellness, incorporation of holistic Indigenous practices, improved access to community services, and finally, tracking of health diagnostics for a measurable approach.

Community Wellness

The approach to our first pillar, community wellness, calls for making existing opportunities more accessible, increasing the number of people taking advantage of these initiatives, while simultaneously improving the existing systems supporting them. The Mohawk Council of Akwesasne, Community Health and numerous individuals in the community provide a number of opportunities for the improvement of physical, mental, spiritual and emotional wellness in their community. These programs include The Green Food Bag, a service offered by the Department of Health, which provides fresh fruit and vegetables to households at a low cost on a monthly basis; daily yoga, pilates and fitness classes at the recreational center, free cooking, knitting, art, and taekwondo classes. Also provided is an adventure club that takes groups of individuals outdoors to experience nature through hiking, bike rides, fishing, and other activities. These are just a few of the many programs and opportunities available to the people of Akwesasne. Unfortunately, participation rates are rather low with stagnant growth uptake. Many individuals are restricted to the programs in their own district or are unaware of when and where things are happening. Our proposed solution will address these impediments in a multi-faceted approach, through improved intrinsic motivators of awareness; ease of scheduling and community connection; by improving accessibility via more affordable transportation, and through measuring the effects of our efforts to further improve existing services.

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Adding to the lack of community wellness is the barriers to healthy food sources within the community, including long drives to grocery stores, and high levels of mercury in both the Saint Lawrence River and surrounding soil, stealing our traditional practices of gardening. To address the issue of food insecurity and inaccessibility, we will implement three Smart Greenhouses through a phased roll-out approach at each of the Akwesasne Mohawk Board of Education (AMBE) Schools locating one in each district. The intention of this project is to first create a curriculum based on agricultural education teaching years 6 through 13 on how to grow fruits and vegetables with the importance of a healthy diet. The second goal of this project is to help address the transportational barriers by using students as a vehicle to get healthier options onto young families tables. Lastly, gardening promotes physical health, mental health through stress relief, exercise, brain health, nutrition, and healing, which is not only a contributor to reducing pre-diabetes, but also following the teachings of our Indigenous and Mohawk practices.

Our Greenhouse implementation is planned to be fully automated including temperature control, the amount of light saturation, humidity levels, soil moisture as well as other factors. Smart greenhouses can be controlled remotely over the cloud through an application, eliminating the need for a person to be present for most operational needs. By using IoT, sensors and actuators, factors such as temperature and humidity can be monitored remotely, and changed based on needs to create the most viable growing environment for the products. Although fully automated, connecting children with the natural world and allowing them to explore the outdoors, including our school gardens, will be an integral part of our integrated curriculum. Students work in the garden, weeding, watering and tending to the beds. Classes utilize the space for lessons in science, social studies, math, reading, writing, and painting. A living laboratory, children are growing, experimenting, observing, measuring, comparing, and learning to care for something that is important to the Akwesasne Mohawk Board of Education and to sustainability efforts around the world. A garden is as much a story about the people who create it as it is about the garden itself. School Greenhouse Gardens are spaces for "hands-on" education, incorporating the full cycle of learning associated with healthy food - from growing to nutrition to cooking and eating. This will provide hands-on learning experience and a living classroom for Akwesasne.

Incorporation of Indigenous Community Practices

Many of the issues we face, and particularly the challenge we are experiencing with diabetes, can be attributed to the loss of the traditional ways of diet, activity levels and mindset. To tap into the strength of our traditions we will be integrating these cultural beliefs that served us well for centuries. These practices, even if put to use in combination with modern

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technologies, will once again help us regain our vitality.

Our intention to incorporate Indigenous Community Practices means we will approach health and wellbeing from more than just the modern clinical perspective. Akwesasne is part of the Haudenosaunee Confederacy and remains connected to our traditional roots. Holistic Indigenous practices encompass three principles that were introduced to our people as the Peacemaker traveled the land: Kankonhriio or Goodmindedness, Sken:nen or Peacefulness, and Kasastensera or Strength. This teaching became known as the Great Law of Peace. Essentially, what the Peacemaker taught throughout the territory was that the practice of Kanikonhriio or Goodmindedness would bring Peace or Skennenkowa to the people in the land. When the Peacefulness was pervasive through the territory, the people would gain a Strength or Kasastensera that could not be overcome by negative forces. From a Haudenosaunee perspective Goodmindedness, Peacefulness, and Strength are synonymous with the concept of mind, body, and spirit. This holistic approach to wellness has gained significant traction in alternative healing practices. The popularity of respecting the interrelationship of mind, body, and spirit is undoubtedly due to its effectiveness, especially in combination with modern medicine or as an alternate. In the Haudenosaunee Wellness Model, the 'health' of Haudenosaunee individuals, families, clans, communities, nations and overall confederacy can be measured using indicators strictly from our teachings and cultural mores. Likewise, an individual can receive guidance on a process to return to a state of 'health' using our traditional teachings and ceremonies.

The Haudenosaunee Environmental Task Force has proceeded with a project to develop an environmental protection process based on their Indigenous world view and relationship with the natural world. Such a process enables individual nations and communities of the Haudenosaunee to protect and restore the natural world, while helping to preserve their unique relationship with it, as a sustainable society. The process devised criteria and indicators for health of the natural world including people, which has a foundation in Haudenosaunee culture and traditions.

Through our Smart Cities Challenge proposal we keep these teachings and values at the center of all solutions, smart or otherwise. The Akwesasne Community Application will embrace holistic Indigenous practices through the teachings it contains the insights it provides to users, and the accessibility of these resources. The application will simply provide the means for the people of Akwesasne to achieve and maintain Good Mindedness, Peacefulness and Strength.

Improved Access to Community Services

The geographical footprint of Akwesasne is unique and includes jurisdictions in Ontario, Quebec and the state of New York. For many citizens, significant distances, travel

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times and border delays both ways impact accessibility to major services. This limits our access to facilities and infrastructure where physical health, fitness activities and training are provided as well as accessibility to fresh, healthy food.

Without personal vehicles, getting between major public hubs or to a grocery store, fitness and recreation centers, or healthcare providers is unfortunately challenging, and a real impediment to these trips occurring. Right now Akwesasne relies solely on taxi-cab. These companies — based out of surrounding cities Cornwall, Ontario and Massena, New York — charge high rates to travel into the districts of Cornwall Island, St. Regis, and St. Snye. Additional charges accrue due to the extremely sparsely populated community and additional drive time to come into the reservation. Our plan in overcoming this challenge is to bring affordable and accessible public transportation to the community of Akwesasne. To do this we will organize a Mohawk Council of Akwesasne (MCA) subsidized taxi-cab service, as well as designing and beta testing a project for on-demand electric public transit bus services. Through these two transportation initiative we will facilitate the important movement of our citizens between our districts and to needed services including fitness and recreation centers, healthcare providers in various locations and to purchase food at grocery stores. Through a phased roll-out approach we will begin by purchasing an electric vehicle per district in order to gain feedback on the program and truly understand our capacity requirements. Based on the preliminary research this will lead to four cars per district, a total of twelve cars as allotted in our budget.

Tracking of Health Diagnostics for a Measurable Approach

The prevalence of Diabetes in First Nation communities is disturbing. Diabetes Canada states the rate of diabetes for First Nations individuals living on a reserve is 3-5 times higher than other Canadians. The Canadian national average is 9%. The rate in Akwesasne is 33%. While we plan to include many measurements in the Smart Cities system — to help us understand and influence patterns of behaviour, optimize services and logistics, to provide feedback to help in the iteration of ideas — one measure is preeminent in our challenge: the number of new cases of diabetes in Akwesasne. This one number must be reduced to that of the Canadian national average. This is the goal which all the other pillars and tactics will be organized to achieve.

Consistent with research on diabetes in First Nations populations, the Akwesasne rate is more than three times the Canadian average. Through the aggregated data received from the Akwesasne application, CANRisk surveys completed within the application, individuals referred to the diabetes prevention and management team as well as the number of new cases of diabetes in Akwesasne, we can measure the relation between our efforts and the Smart Cities Challenge initiatives with a real change of diabetes in Akwesasne.

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(CANRisk surveys provide questions that help individuals determine if they are at higher risk of having pre-diabetes or type 2 diabetes.)

Apart from the measuring of health outcomes and diagnostics indicative of medical issues, our work with the Mohawk Council of Akwesasne Executive team also narrowed in on Key Performance Indicators that would indicate if our solution was having a positive effect on the factors contributing to health outcomes; for example, were our chosen tactics shown in the behaviors of the community? Were our solutions achieving key objectives? The Akwesasne Community Application and digital ecosystem through which transportation and participation rates can be collected and analyzed is central to the measurement and understanding of these contributing KPI's.

To address this pillar, and the key performance indicators contributing to your Challenge statement we will collect and aggregate all of the data gathered from the application including CANRisk survey results, usage rates of programs and services, and progress of health metrics in aggregated form and display it in a dashboard view for the Mohawk Council of Akwesasne. This will allow us to understand both baseline data within our community and understand how our efforts are relating to decreasing the new cases of diabetes.

With these four pillars — Wellness, Tradition, Access, and Measurement — at the center of our Smart Cities Challenge, we will improve community wellness by developing better services while creating more affordable access to them. We will incorporate Indigenous Mohawk culture to tap the wisdom held in our traditional teachings and approach all issues with a more holistic mindset respectful of nature. All the while measuring movement towards targets, to show proven results or highlighting a need to adapt to better serve our people.

Reflective of the true needs of the community; as demonstrated through a compelling body of data and evidence and extensive resident engagement. Ambitious, achievable, and meaningful for the community and it's residents.

A human centered-design approach is based on delivering solutions that meet the true needs of the community, that are meaningful, that are aligned through initial and ongoing engagement with the end users. Consequently, our Smart Cities team has kept Community Engagement at the forefront of our Smart Cities Challenge solution. Over the past seven months, we have implemented the Design Thinking methodology in its many forms, facilitating workshops with important user groups, surveying and interviewing internal and external stakeholders. And, as this information provided direction and formed into ideas, prototypes and application interfaces, we gained feedback from Akwesasne community members on our solutions and how they should iterate via rounds of user testing. Our partners,

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zu, knows from experience that it is best to "measure twice and cut once" in designing solutions, which means keep users in the loop until things are completed, or one is likely to complete the wrong thing.

Using the Design Thinking process our outcomes and approach ensures the true needs of the community are served. Community members are the ones who both identified the problems and helped ideate the solutions. They were and are conferred with every step of the way providing feedback on solutions, voting on the best implementation strategies, and user testing our prototypes. In the past consultants sought to implement their own "expert" ideas in prescriptive ways; in Design Thinking, however, users are encouraged to critique things and provide their ideas on what would be a better implementation for the community.

In addressing the question of whether our identified challenge is meaningful to the community, we put forward this data point. During our community engagement events, we surveyed all individuals in attendance and found that 82% of respondents had either suffered from Diabetes themselves or had a family member who did.

Ambitious, achievable and meaningful for the community and its residents

When we look at our Smart Cities Challenge Solution, we believe our challenge statement defines ambition. Despite advancements in medical treatments and technology, diabetes remains a prevalent chronic disease that afflicts a huge number of Canadians and more specifically, Indigenous people. We recognize that reversing the prevalence of diabetes in Akwesasne requires a strong desire, determination, and hard work. This will mean, first, work to be done by the community and the vendor partners in determining what tools will come into existence, followed by commitment by our community members in engaging in the new systems and supporting these new approaches to health, fitness, and traditional mindsets. It is an ambitious undertaking to address a problem affecting so many individuals in the community, across Canada and around the world. We are excited and driven by the opportunity to create a healthier Akwesasne, as well as creating an approach that is intended to be extensible and actually extended to a much wider population.

Although our challenge is ambitious and potentially far-reaching, we have taken a very practical, grassroots approach to solving it. In looking at the many software project debacles over the past years, we observe the common problem that these systems were designed by experts for the many — but failed for the individual users — and so failed for the many, too. We started with individuals as we believe if our approach can be confirmed to work for one it has a much greater chance of working for the many.

The community is telling us our solution, the one they have helped us to develop is

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achievable. While there are more science-fiction oriented tech in existence, our choices, though less appealing, are based on proven technologies with the basic goal of providing our people with better access to the essentials of life.

- Smart Greenhouses Agriculture solutions account for 6% of all IoT projects, giving us confidence in a successful implementation with capable partners in order to cut operating costs and make the most of the available arable land in Akwesasne.
- The use of electric vehicles (EV) continues to grow with nearly 50,000 plug-in vehicles in Canada and the growth of 68% in 2017. Our Smart Cities Challenge will implement this proven technology as an economic and environmentally sustainable approach, which also meets the practical challenges of transportation for people, and the delivery of quality food and services.
- Design Thinking is reshaping service delivery and product design in industries from tech to banking and everything in between. Business consultancies are buying up Design Thinking shops as they have recognized the importance of Design Thinking to organizational strategy and success. We have chosen to use this approach to identify opportunities and problems and to produce solutions always in touch with our citizen users.
- In partnering with zu we are tapping both their expertise in Design Thinking, but also in their high success rate of creating digital products that centralize an array of components and capabilities. We will create an integrated technological solution that combines mobile applications with an administrative back-end while integrating third-party services and information feeds from other systems associated with services, greenhouse inventories, event scheduling and so forth. Our solution requires us to bring services, educational components, scheduling, information collection, and other capabilities together through a hyper-localized web-application to achieve success through a holistic system of seamlessly flowing parts. The Akwesasne Community Application will be used as an education tool, management software, expediter of services, and a collector of information.

Well-suited to a smart cities approach

Being a Smart City can mean many things. It can look very different depending on where you are and what is your pre-eminent challenge or opportunity. But the objective is always the same – using technology to create a sustainable future and improve the quality of life for people. As we come closer the end of our finalist phase, we are confident our solution takes on both this Smart City approach to technology, but also its approach to openness, integration, transferability, and collaboration.

Openness derives from our commitment to

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building this project with the community, and not for the community. Unlike many technology projects, we are not using a team of experts working in secret to produce something without their input, which our citizens will then be trained to use. Openness is embodied in what this is for and how it will work. Openness is also driving our planned collection and sharing of data and results, which are used to motivate improvement at an individual and group level, so progress can be celebrated as we move towards improved health. And openness also requires transparently communicating data collecting, use and disclosure with our users, always respecting privacy best practices.

Integration is embodied in the development of tools that fit into the lifestyles and activities of community members, rather than requiring our folks change to fit the system. Integration is represented in the interaction and interdependence of the capabilities we plan to develop in the Akwesasne Community Application. Each capacity — education, transportation, access to services and better food — enables or relies on the next, supporting our recognition of the interplay of curasitive and curative elements associated with our challenge. This dependence of factors is supported by our traditions, where mind, body, and spirit are supportive of a combined single strength. Our traditional teachings tell us there is a wholistic state of balance where maximum strength is attained. Our people can receive guidance on a process to return to a state of 'health' using our traditional teachings and ceremonies. In this case, technology will help us organize and integrate an additional combination of knowledge, tools, accessibility, transportation, measurement, feedback, health services and nutrition. All facets will be integrated in a virtuous circle to achieve more than the sum of the parts.

From the beginning, the approach has been about engaging our community, being open to ideas and feedback, and relying on even the most basic direction of identifying: What do we want this to be about? We believe that a human-centered design and co-design approach consistently produces a collaborative solution for the people and by the people. When one looks at our Smart Cities Challenge integration is a pivotal piece of it, we bring together Healthcare, Education, Public Transportation, Community Initiatives including recreation Integration is a large piece of our project, bringing together many essential services from nutrition, healthcare, education, executive council, public transportation services, data management, traditional practices, and more into one silo and system to provide seamless and high quality service to the community of Akwesasne. This is what integration means to our Smart Cities Proposal, it means bringing people, business and essential community services together to make them more accessible and affordable through collaboration.

Our strategy to solve the challenge that addresses root causes; it targets opportunities for improvement that also exist for many Indigenous communities the world over. As success is realized our

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approach should be shared. Our system ideas and components can be reused, whether as open-source software or as open-source ideas, all non-proprietary. The technologies will be able to be redeployed in other jurisdictions, incorporating modifications for changes in detail relating to specific communities, health measures, locations, educational elements, transportation challenges, targeted medical conditions and so forth.

National survey data has consistently shown that the national age-adjusted prevalence of diabetes is 3 to 5 times higher in First Nations than in the general population. Diabetes within Indigenous communities The higher rate of adverse health outcomes in Aboriginal peoples is associated with a number of factors, including lifestyle (diet and physical activity), genetic susceptibility, and historic political and psychosocial factors, stemming from a history of colonization that severely undermined Aboriginal values, culture, and spiritual practices. Barriers to care that are unique to Aboriginal settings also exacerbate the problem with fragmented healthcare, poor chronic disease management, high healthcare staff turnover, and limited or non-existent surveillance. In addition, social determinants of health, including low income, lack of education, high unemployment, poor living conditions, lack of social support, negative stereotyping and stigmatization, and poor access to health services compound the problem. This is common across Indigenous communities, and we believe the barrier facing the community of Akwesasne is common across all Indigenous communities big and small throughout Canada. We believe our Smart Cities approach, built with open source tools, solving problems people across Canada are facing makes transferability opportunities endless.

The Mohawk Council of Akwesasne and our digital consultancy zu have come together to build something greater than the sum of its parts. We at MCA bring a wealth of knowledge to the table about the barriers our people face, but also about the capabilities we have, and the strength of our teachings rooted in our culture. zu brings an ability to plan and deploy digital strategy, to build digital tools, and a proven knack for driving digital transformation at municipal, provincial, and federal levels. In combination, we bring an incredible amount of insight and opportunity identification to the Akwesasne Smart Cities Challenge. Our partnership to date has resulted in highly satisfying progress. Because this will be an ongoing battle against the challenge of diabetes and for the pillars of health, and given that technology is a rapidly adapting toolset, we expect this collaboration will span more than the timeline of this Challenge. Together, and with other partners, Akwesasne will foster a sustainable future for our people. And if we are successful, we will seek to share our learnings to improve the quality of life of other aboriginal communities, and others, across Canada and beyond.

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Performance Measurement

Using the tools and approaches developed by our solution will enable us to coordinate and collaborate on the necessary changes we need to reverse this plague of diabetes. We bring our sense of community and friendly competition to the table to challenge one another to be our best. The Smart Cities technology we have prototyped will tie in actual results on the behaviours we seek to modify, showing us where to go to next, and transparently reveal whether we are elevating ourselves into a new era of health, or further deteriorating. Our traditional ways will give this new technological approach the heart that it needs in order for it to be relevant to us. The outcome is admittedly ambitious, but it is achievable and so important to achieve.

The outcomes of the success of the implementation of our Smart Cities proposal are measurable first in the principle goal figure of reducing new cases of diabetes, and secondly, in the lifestyle measures that reduce the risk of diabetes. All measures are available to be measured by our application through unlinked aggregation. These specific measures include.

- The capacity of public transportation
- An individual's distance to programs and services
- Citizen awareness of available programs and services
- Number of people attending public programs and services or using videos within the app.
- Number of people completing in-app challenges or Competitions
- CANRisk surveys completed in-person, and through the Akwesasne Community Application.

Avoidance of diabetes going forward would indicate a major overall improvement in health and well-being for this community, and provide a way forward for other communities that adopt the protocol we will model.

In combining the new digital tools and medical knowledge the modern world provides with our traditional approaches that protected our health and environment in the past, our community will build a modern foundation of health to move forward, as with health, all things are possible.

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Project timelines, deliverables, and milestones that are ambitious yet attainable

Our project timeline spans a total of 24 months with notable milestones throughout that frame. Implementation of the application, dashboard, greenhouses and electric transportation system will all fall under this 2-year approach. Broken into a 4 phases, like many software projects, the creation of our application and dashboard will entail the strategy and validation of our findings to date as well as design and development. Working in tandem, the implementation phase of the Greenhouses and Transportation System will be completed with the same time constraints due to feature reliance on application qualities.

• SEE TIMELINE ON PAGE 20

• SEE MILESTONES ON PAGES 22 – 24

Our planned health and wellness initiatives contained in our solution are intended to reduce the prevalence of new cases of diabetes. Measurement is critical to monitoring the impact of these initiatives on stemming new cases of diabetes. In a workshop format organized by our consultants at zu, our Directors of the Mohawk Council of Akwesasne identified key performance indicators believed to capture the essence of our planned approaches. Working collaboratively, we developed 3 core metrics to measure the effectiveness of our initiatives health and with each metric, we ask 5 critical questions. Our 3 core metric categories are Access, Participation, and Screenings. Our 5 critical questions regarding each KPI are: Why does it matter? What affects it? What can we control? What are the measurables? What are the targets?

Key Performance Indicator #1: Accessibility

The Access KPI is defined as a measure of accessibility by community members to public health and wellness programs. For example, individuals seeking opportunities for active living, seeking health care, or at-risk individuals meeting medical program requirements. Measurable factors include the capacity of public transportation, an individual's distance to programs and services, and citizen awareness of available programs and services.

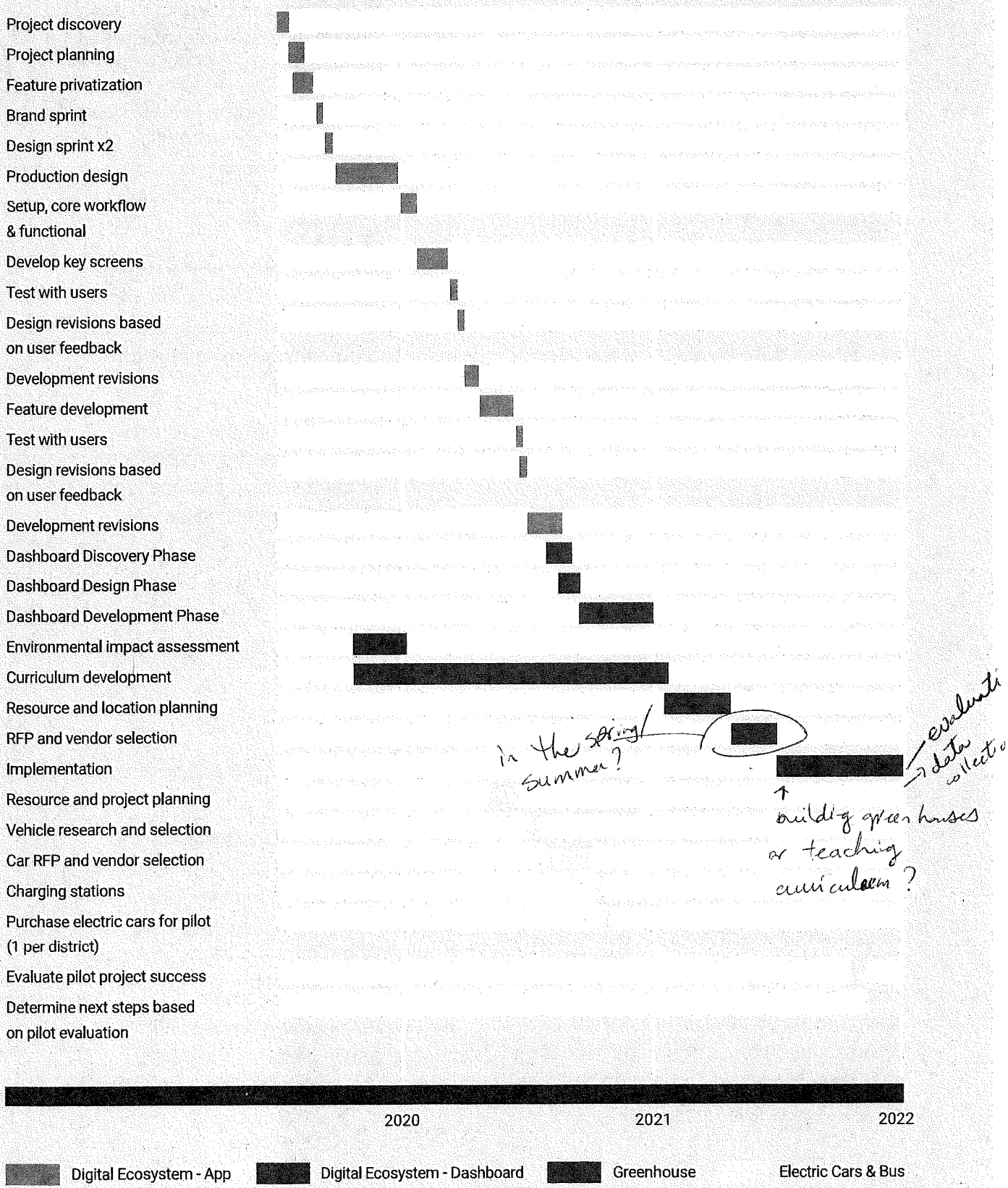
Why does Access matter? Transportation, location and awareness of opportunities all impact the community's and at-risk individuals' ability to live active lifestyles, obtain healthy food options and take advantage of any services not in their home location.

What affects Access? Home location, income, access to public transportation, access to an automobile, distance to the desired service, location of healthy food options.

What can we control about Access? Transportation options, scheduling, and coordination of transportation options, the

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Project	Timeline
Project discovery	
Project planning	
Feature privatization	
Brand sprint	
Design sprint x2	
Production design	
Setup, core workflow & functional	
Develop key screens	
Test with users	
Design revisions based on user feedback	
Development revisions	
Feature development	
Test with users	
Design revisions based on user feedback	
Development revisions	
Dashboard Discovery Phase	
Dashboard Design Phase	
Dashboard Development Phase	
Environmental impact assessment	
Curriculum development	
Resource and location planning	
RFP and vendor selection	
Implementation	
Resource and project planning	
Vehicle research and selection	
Car RFP and vendor selection	
Charging stations	
Purchase electric cars for pilot (1 per district)	
Evaluate pilot project success	
Determine next steps based on pilot evaluation	



location of activities, location of healthy food options, delivery options.

Access Measurables - Program and services enrollment numbers, program and services communication engagement (social media engagement, application analytics, communication reach). Public transit capacity and utilization (seats available, usage). Greenhouse Food Box delivered/picked up.

Access Targets - Increase in program and services enrollment, increase in public awareness of Akwesasne programs and services, increase public transportation capacity, increase in public transportation usage, increase in the number of locations for healthy food options, increase in healthy food options used.

Key Performance Indicator #2: Participation

The Participation KPI is defined as the number of community members and at-risk individuals making use of public programs, services and completing app challenges. This includes the number of people attending public programs and services and the number of people completing in-app challenges.

[redacted]

Why does Participation matter? Participation levels indicate the uptake of these programs, services, and app challenge uptake, and are a precursor to them having positive effects. Tracking will inform future programming by indicating that oversubscribed programs should be scaled, and less popular ones should be re-examined. Initial participation levels for community activity will establish a baseline, so that modifications can be shown to improve or reduce participation levels. [redacted]

What affects Participation levels? Location of opportunity, distance, accessibility, weather, quality of offering, ties to Akwesasne heritage, the motivation of the individual, awareness of opportunity.

What can we control about Participation levels? Access to transportation, the location of opportunity, cost, awareness, motivation, quality, association with Akwesasne heritage.

Participation Measurables - Number of attendees for programs and services, number of completed in-app challenges, feedback on the experience. [redacted]

Participation Targets - Increase participation number for programs, services and app challenges. Increase participation numbers in targeted age groups: youth, family, and senior.

Key Performance Indicator #3: Screenings

The Screenings KPI is defined as the number of CANRisk surveys completed by undiagnosed community members. This includes both CANRisk surveys completed in-person, and through the Akwesasne Community Application.

Why does Screening matter? Early intervention in diabetes risk factors can prevent long-term illness; broader

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Application & Dashboard

MILESTONES	ZU	DELIVERABLE
Phase 1: Validation Stage	• Project Discovery • Project Kickoff & Planning • Feature Prioritization • Technical Discovery	• Presentation on approach and plan.
Phase 2: Design	• Brand Sprint • Finalization of Branding • Production Design • Task & Work Flow Design • Development Consultation	• Summary Report and Style Guide from Brand Sprint • Design Strategy Report • Sitemap diagram outlining project architecture.
Phase 3: Application Development	• Development Setup • Core Workflow & Functionality Development • Development of Key Screens • Feature Development	• Application page templates • Application building completed • Testing, Quality Assurance, and Revisions Completed
Phase 4: Dashboard Development	• Development Setup • Core Workflow & Functionality Development • Data Collection and Parsing • Chart Styling	• Dashboard building completed • Integration with application completed • Testing, Quality Assurance, and Revisions Completed

Smart Greenhouse Implementation

MILESTONES	MCA TASKS	DELIVERABLE
Phase 1: Project Planning	• Environmental Impact Assessment • Resource and Location Planning	• Environmental Impact Assessment Document
Phase 2: Curriculum Development	• Hiring of Specialist • Collaboration with AMBE	• Curriculum Implementation Plan & Rollout .
Phase 3: Request for Proposal and Vendor Selection	• RFP Development, Analysis, and Selection	• Selection of successful vendor.
Phase 4: Implementation	• Overseeing and management of vendor implementation • Integration with application	• Greenhouse Implementation Completed

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Electric Public Transportation System

MILESTONES	MCA TASKS	DELIVERABLE
Phase 1: Project Planning	• Resource and Project Planning • Vehicle research and selection	• Environmental Impact Assessment Document
Phase 2: Request for Proposal and Vendor Selection	• RFP Development, Analysis, and Selection	• Selection of successful vendor
Phase 3: Pilot Implementation	• Purchasing and Implementation of 1 Electric Car / District. • Integration with application • Evaluation of pilot project success	• Determine next steps based on pilot evaluation

community CANRisk screening results establish a baseline from which our challenge can measure its overall effectiveness; a CANRisk baseline allows comparison of community rates to national standards; a CANRisk baseline provides a clear picture of those at-risk in Akwesasne.

What affects Screening participation rates? Education about diabetes and health risks; awareness of what the survey results mean; public perception, access to survey.

What can we control about Screening participation rates? Increase the availability of survey; increase education and awareness of what individuals should do given the results of their survey; facilitating streaming of at-risk individuals to clinics for preparation of personal plans for diabetes prevention.

Screening Measurables - Number of CANRisk surveys completed; the number of individuals recommended to health professionals.

Screening Targets - Increase in the number of CANRisk survey completions; increase streaming of at-risk individuals to clinics for personal prevention plans.

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Payment Schedules

WEBSYSTEM PAYMENT SCHEDULE	DATE	AMOUNT
Phase 1: Validation Stage	July 1, 2019	$212,212.50 + tax
Phase 2: Design	September 1, 2019	$319,050.00 + tax
Phase 3: Application Development	January 1, 2020	$578,925.00 + tax
Phase 4: Dashboard Development	July 1, 2020	$295,950.00 + tax

SMART GREENHOUSE PAYMENT SCHEDULE	DATE	AMOUNT
Phase 1: Greenhouse Engineering, Resource Planning and Design & Curriculum Development	July 1, 2019	$590,000.00 + tax
Phase 2: Tsi Snaihne School Community Outreach Greenhouse Implementation	April 1st, 2021	$500,000.00 + tax
Phase 3: Kana:takon School Greenhouse Implementation	July 1, 2020	$350,000.00 + tax
Phase 4: Ahkwesahsne Mohawk School Greenhouse Implementation	October 1st, 2021	$350,000.00 + tax

ELECTRIC PUBLIC TRANSPORTATION PAYMENT SCHEDULE	DATE	AMOUNT
Phase 1: Project, Resource & Location Planning	June 1, 2019	$150,000.00 + tax
Phase 2: Piloting and Evaluation of Smart Taxi and Electric Bus Implementation	November 1, 2020	$535,000.00 + tax
Phase 3: Extended Implementation	October 1st, 2021	$480,000.00 + tax

** Project Coordinator and Project Assistant Coordinator are allocated throughout the Smart Greenhouse Payment and Electric Public Transportation Schedules.*

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Project Management

HUMAN RESOURCES

The Smart Cities project will provide many benefits towards new skill development, as well as full and part time labour opportunities. Part of the value of these employment opportunities will be knowing that the work directly benefits our community and has the higher purpose of improving health outcomes and quality of life at Akwesasne. There are many specific roles to fill, which we are confident we can recruit — or train and recruit — from our own community.

- For overall project oversight, A Project Manager position and an Assistant Project Manager will be secured to oversee the components of the Akwesasne Smart Cities project.
- To prepare the team for the Smart Greenhouse System, Economic Development will organize and familiate an agritech course so that the community will have a trained workforce from which to choose the actual employee team for the greenhouse implementations.
- Electric Public Transportation System drivers for the three small electrical vehicle programs — the Smart Taxi Service, the Smart Health & Social Programs Delivery, and Food Delivery Services (all for people), as well as drivers for them — will be secured through a job opportunities program drawing from our local employment resources. This will provide our programs with a pool of applicants from which we can select the best team members.
- To facilitate our community member end-users' use of the new technology, we will recruit Akwesasne high school students who will be put to work through a Best Matches program within our community centers in order to offer assistance to the elderly and other technology challenged community members. Here the young will mentor those who would like to learn how to better utilize their smartphones so as to make full use of the Akwesasne Community Application System, and all its various capabilities.
- In addition, our Mohawk Council of Akwesasne Information Services technical team will be trained by our technology partners (zu) to support the technical requirements of the Community Application System Administrative functionality, which is to be housed within our territory. This is

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the back-end to the mobile Akwesasne Community Application System and is responsible for organizing and supplying the mobile app with much of the information it presents. The training will ensure the Akwesasne Information Services technical team can maintain and administer the system, publish to it, update the app with information, news, educational elements, food inventories, maintain interactions with third party payment systems, make use of the information it aggregates, and so forth.

- **Electric Public Transportation System under-use may impact its viability**

  As the planned Electric Public Transportation System — consisting of the Smart Taxi Service, the Smart Health & Social Programs Delivery, the Smart Delivery Service and Electric Bus Services — is planned to collect minimal fees, there is a risk to the financial viability if there is underutilization of the capacity. This could creates an unsupportable cost burden. While there is a possibility that the smart taxi service may not be utilized, this risk seems rather small given the enthusiastic reactions noted at the community engagements. All have been strongly supported with "Can't wait!" attitudes toward a local taxi service at affordable rates.

  - Mitigating the case of low ridership for the electric vehicles, a fall back deployment is that the bus will still be utilized for the planned weekly runs our college students make to the Iohahiio facility.

    - Mitigating the case the case that the smart taxi and delivery services are not utilized, these vehicles will be re-allocated for use with the health and social programs.

- **Greenhouses in particular locations are underutilized**

  The activities associated with management of the greenhouses in the Smart Greenhouse System will be incorporated into the Akwesasne student curriculum. A greenhouse will be located at the Akwesasne Mohawk School with the purpose of learning and food production. If this greenhouse is not used to minimum required levels the AMS School's greenhouse there is a risk to the viability of the greenhouse system.

  - Mitigating the case of underutilization of the AMS school greenhouse container, that unit will be moved to closer to the Environments Offices and utilized within the agriculture sector for food production. Alternately, it can be relocated to the Iohahiio Education facility and be utilized for future adult courses on Innovative Growing Techniques.

  - This risk is highly un-anticipated as all greenhouses will be worked into the curriculum of the school.

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Procurement, including alignment with technology and partnership requirements

MOHAWK COUNCIL OF AKWESASNE PROCUREMENT STRATEGY

Our procurement strategy prescribes that when making purchases our council reaches out to at least three vendors through an RFP Process. For this purpose a purchase team is formed generally involving a finance department representative, a project manager and a manager representing the department impacted by the proposed purchase. This team then oversees the RFP process and reviews the incoming responses.

The Purchase of the Electric Bus for the Electric Public Transportation System will be administered through the Mohawk Council's Department of Community and Social Services along with the Board of Education's Transportation Supervisor. This person is key to the team as all further bus maintenance and bus scheduling decisions will be the responsibility of the transportation supervisor's position.

The intention of the Smart Taxi Service, the Smart Health & Social Programs Delivery, and the Smart Delivery Service is to create increased access of our social clients to have the means to obtain healthier foods, as well as to transport community members to medical appointments. ("Social clients" are individuals getting assistance from Community and Social Services.) These vehicle purchases and services, as well as the Smart Taxi Service Pilot Project will be organized through a team consisting of the Smart Akwesasne Team and the Social and Health Departments.

The Smart Greenhouses system purchases will be reviewed by a team comprised of the Akwesasne Mohawk Board of Education, and representatives from the Department of Tehotienawakon Economic Development program.

And, the most important precursors to desired change may not be what we are originally focusing on so our analysis of impact and influence should be somewhat adaptable.

Stakeholders, including analysis of impact and influence

ANALYZING IMPACT OF PROGRAMS

For each of our Smart Cities project initiative categories, we will put in place oversight teams best representing stakeholders of the area we wish to affect. These stakeholder teams will assist in the identification of success and performance factors, as well as contribute to the ongoing adaptation of measurements to best represent goals and progress attainment. Too many measurements, for instance, will likely be distracting from the most important factors. And, the most important precursors to desired change may not be what we are originally focusing on so our analysis of impact and influence should be somewhat adaptable.

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AKWESASNE COMMUNITY APPLICATION SYSTEM

A key stakeholder — especially in relation to the central challenge regarding the prevalence of new cases of diabetes — is the Mohawk Council of Akwesasne Health Department. This department will be instrumental in delineating the types of data most important to measure to both be effective in affecting the health precursors associated with our Smart cities Challenge, but also for tweaking our approaches to increase the program's effectiveness over the longer run. Targets of change may shift focus with the maturity of our program. For instance, initial goals may be about engagement and usage rates, which later give way to focus on improving service delivery and costs, which give way to focus on renewal and expansion of educational components, cultural curriculums and even recipes. So measurement must be flexible to take into account learnings and overall maturation of the program.

A stakeholder in all data collection, especially that flowing though the Community Application and Community Application Administrative system, is the Akwesasne Information Services technical team. This team is key to the always necessary step of information aggregation, organization and preparation for analysis by the more specific department stakeholder. The Technical Team will be included for both their technical support and technical knowledge. They will help clarify other team members understanding of the information, and so positively influence decision outcomes.

The Mohawk Council of Akwesasne Health Department will be primary users of the statistics and interpretation of data directly affecting health measurements and behaviours affecting health outcomes. For instance, screening numbers, service engagement and usage numbers, activity levels, food distribution measures, attendance to health services, missed appointments and so forth.

The Mohawk Council of Akwesasne Social Services Department will be keenly interested in the performance of the Electric Public Transportation System. These statistics are key to success factors in their area of responsibility. Central is the measure of (ideally) increasing transportation usage, which when higher is strongly suspected to better the quality of the lives of the social clients.

Our Smart Akwesasne Team and the Mohawk Council of Akwesasne Health Department will be eager for statistics the

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system produces regarding healthy food delivery, number of users obtaining rides to grocery stores and medical destinations, and increases in trip numbers for personal health care evaluations or screenings. Devising methods to capture behaviours of their individual clients in accessing and making use of transportation to increase wellness is tricky. Defining the base case is also challenging as the base case for the new situation does not currently exist. Therefore, much of the initial information will be used to establish a base case from which these departments will try to build performance.

The Akwesasne Mohawk Board of Education, Department of Tehotienawakon, including the Economic Development and Environment Program will all be paying close attention to the performance of the Smart Greenhouse system. This has an educational component and associated measures of success, as students are both involved in staffing a greenhouse, but also in engaging in learning their operation, and so graduating from the course. Economic Development is seeking to create economic value from the Smart Greenhouses, in the way of jobs, job skill development, food production and food cost savings. Economic Development will also be following the measures around the development of job skills and expansion of roles in technical areas to do with the Akwesasne Community Application and Administrative Web System, as there are many associated skills to do with populating the system with information, writing, video production for traditional cultural teaching dissemination, mentoring new users of mobile tech, system programming and maintenance, social tool use and many additional skills associated with maintaining the vitality Internet based systems. Economic Development may also monitor the economic impacts of new services from both a cost and revenue outlook, as well as on the value of keeping money associated with transportation in the community, rather than that money flowing to external transportation options. The Environment Division will be able to calculate the savings in CO2 production enabled by the switch of thousands of travel miles to electric from gas powered vehicles.

Communications strategies for community involvement, training, and feedback

Following the Design Thinking processes that have gotten us this far, we are eager to continue regular community engagements through quick surveys to gain feedback and ideas, so that we can continue to improve the system. With the core of the system based on the Akwesasne Community Application, which is a mobile hub in each community member's pocket, we have an immediate tool through which we can share information, news, questions, and new capabilities.

This is highly advantageous to the rapid evolution of our services. We can both listen directly to feedback and observe behaviour. Through questionnaires, polls,

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message boards and so forth, and we can observe behaviour, measure usage stats and so gain objective data. This may be an important balance as requests for feedback are likely to be weighted towards the opinions of more active or prolific online personalities in the community, with the new users less comfortable with writing essays on their new smartphone.

Additionally, because the Akwesasne Community Application is Internet-based, additional functionality to do with surveying, for example, is only a click away. There is no value to creating our own functionality in most cases, such as for polling — that is already available for free or very low cost online. We will simply use our in app capabilities to post updates that link to surveys, or to video resources, third party educational elements and so forth.

We expect that to best increase engagement with the new Smart City tools of our diverse end users, especially with social clients, that this may best be undertaken in a combination session of in-person instruction with also the online system in hand. Education sessions and review sessions are likely to occur in this way for clients involved in the services of specific departments, to learn how this department's services are now offered via the app. For example, our social clients can be introduced to Smart Taxi, Electric Bus pickup request, and so forth —when they are meeting with case managers. Groups feeling a need for the extra nudge of in-person training can also attend organized evening community engagement sessions, where everyone brings their phone and learns about a newly released function.

Monitoring, controlling and reporting strategies and checkpoints for contingencies and course corrections, if necessary

Following the Design Thinking approach, we will use the app to gather reviews on components, experiences with the services, ideas for improvement, and suggestions on how to make things more efficient. While Design Thinking helps with direction, zu uses the Agile Method for digital product delivery. The idea with Agile is that via frequent meetings with the client, (the Akwesasne Smart Team) progress on the functionality is reviewed and tweaked very regularly, as the application moves from minimum viable product to fully featured one. This emphasizes actual experience with the tool over documentation, and is proven as the best way to deliver software products. The whole approach is about course correction, about feedback from users.

This also provides a built in approach to managing scope while optimizing end result. We've used Design Thinking to collaborate with our community to get a very strong idea of what we need; BUT, until it is in the user's hands, and they are standing and waiting for pick-up from an Electric Bus, we can expect unforeseen problems to crop up, or cool new ideas for enhancement to emerge. It may be that, at this early stage of testing, that a scheduling

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idea for the Electric Bus is decided to be more important than some already planned feature of the Smart Greenhouse ordering, and since the greenhouse will not reach full production for another year that programming resources will be used by diverting them to the bus scheduling enhancement. So the scope is rebalanced in collaborative agreement between us and zu. Our Project Manager and their Product Owner notes this change of resource use and we move promptly on with development, without the overhead of massive documentation and change orders. When you are inventing new things this is the way to be. (If we are ordering a new community centre and it already has a complete blueprint, then the more formal change order approach is necessary.)

In regards to the purchasing of electric vehicles and greenhouses, a more detailed process of estimates, associated charges and fees, delivery and set-up, even total cost of ownership will be adhered to. Traditional cost controls are more appropriate to capital purchases. Purchasing bespoke software must also fit timelines and deliver certain features, it's just that what's in the final product will be impacted by ideas, epiphanies, and feedback and should be encouraged. Like a cook tasting their cooking along the way.

That being said, zu is well practiced in building digital products and services, including monitoring burn rates and being totally transparent with their clients as their software development project progresses. With their total team recording to time sheets, tracking progress in Jira, tracking our requests in Zendesk, all bolstered by regular weekly meetings with our Project Manager, and not even including the ongoing email, messaging and phone calls between our PM and their PO, there is little room for things to go off the rails without being immediately noticed. More formal reports are generated with every meeting and supplied to Smart Coordinator for review and action when required.

Weekly reviews of zu's Replicon time tracking system, where tasks are assigned a budget aligned to the statement of work, provides our Product Owner with real-time visibility on project health, task churn and slow down caused by blockers or delays. This information is then documented in the weekly Project Status Report provided from zu to MCA and any necessary steps to remove blockers or flag risks are discussed in weekly production meetings with the us.

There is a sweet spot between rigid timelines and development targets, and the serendipity of discovering new methods or better functionality changed by user testing along the way. zu explains they are well practiced at respecting the organizational necessity of steady progress towards agreed upon projects with the idea that we are in fact inventing the future, and the path towards invention may have a few unexpected twists and turns. Through our Production Road Map, several stage gates are implemented as a monitoring and course corrections strategy. Stage Gates are a project management technique in which an initiative or project is divided into distinct stages or phases, separated by decision points. At each of these phases,

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we will revisit scope, timeline, and budget, making any appropriate adaptations where necessary.

Approach to sustaining projects beyond the lifecycle of the challenge, if appropriate

Our vendor partners will be resources to assist us in our plans to gain a maximum lifespan from our Smart Cities Project. While we intend to be self-sufficient in the longer-term continuation of the Smart Cities systems, we also recognize that there is a need to renew and adapt the system with more modern versions of itself. At the very least there will be ongoing maintenance and enhancement of systems, with which the original vendors are expert, and can assist us in becoming expert, as well. This necessity to keep working to improve the system is to both preserve the functionality of things as they will be at the end of the first phase, but also to adapt to new technologies of our modern environment, and to take advantage of the emerging technologies, as we are doing at this point in time.

The Akwesasne Community Application (Mobile and Administrative) will be supported and maintained by the Mohawk Council of Akwesasne Information Services Program. zu may be called upon for more ambitious functional additions from time to time, though this is not currently part of the scope of the plan.

Smart Greenhouses will be sustained in conjunction with the Akwesasne Mohawk Board of Education (AMBE) and the Department of Tehotienawakon Environment Program, for the Akwesasne Mohawk School (AMS) and Tsisnaihne schools. The AMBE, Tehotienawakon Economic Development Programs will jointly utilize and maintain the St. Regis Smart Greenhouse location as it will be used for the school and as a special needs work experience location. We anticipate that this location has the potential to provide economic contribution to sustain the special needs program.

The Electric Bus will be fully sustainable through the budget of the Social Services Department. The Electric Bus expenditure simply represents a redeployment of a portion of and existing budget already dedicated to assisting their clients with transportation.

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Technology

DETAILS ABOUT THE TECHNOLOGIES INCLUDING RELEVANT APPLICATIONS ELSEWHERE AND RESULTS OF TESTING AND/OR PILOTING IN THE FINALIST PHASE.

In looking at the iPhone as a breakthrough event, it wasn't so much about inventing any of the capabilities it provided as it was wrapping them into one package. Similarly, our Smart Cities Challenge project is about combining the capabilities we know will address our Challenge into an integrated mobile system.

Our Digital Ecosystem encompasses both the Akwesasne Community Application, as well as the infrastructure elements of our plan. Included are native mobile application and web application development, multiple greenhouse implementations, and Akwesasne's first ever public transportation system. Greenhouses and a Smart Taxi service may not be viewed as groundbreaking or emerging technology, but to the Akwesasne community, they most definitely are. Our solution reflects the true needs of the community and will create improved health outcomes, new ways to address our challenges, and opportunities to develop expertise with new technology all through coordinated improvements in infrastructure, information, and accessibility. Akwesasne services will be enhanced with the support and integration of our mobile and web applications, both in what community members receive and in the ability of our public service workers to deliver them. Below we break down the details of the technologies involved, including examining relevant applications used in other jurisdictions, a look at case studies our partner zu has successfully completed and some of the results of testing carried out in this finalist phase.

Mobile application development is the set of processes and procedures involved in writing software for small, wireless computing devices such as smartphones or tablets. Each day thousands of mobile apps are published to the Google Play and Apple App Stores. Some of these mobile apps are games, others are social networks, and many are e-commerce apps. All of these apps, if professionally built, follow a similar mobile app development process.

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Dating back to the early adoption of responsive web design in 2011/2012, our partners, źu, have accumulated extensive experience developing responsive mobile websites and native applications, including the use of front-end frameworks such as Bootstrap and Foundation, as well as custom implementations using CSS3, CSS Grid, and Flexbox. zu's team has developed native iOS applications targeting phones and tablets going back to 2009/10 and iOS version 4. This includes both line-of-business applications based on standard UIKit components, along with richer experiences involving animation and physics frameworks such as Box2D and SpriteKit. They have continued to build responsive and native mobile projects since the availability of these devices and their tech stack continues to evolve.

zu develops widely-used native Android applications targeting phones and tablets for high profile clients, with projects dating back to version 4.0 in 2012. They develop for the core Android framework as well as with Google's trusted third party community partner libraries such as RetroFit, OkHttp, and Glide. zu's team has mature knowledge surrounding automated testing strategies for Android including both unit testing and instrumented testing user workflow. This past winter, a zu designer was selected as one of only 20 people worldwide to participate in a prestigious Android design workshop hosted by the Android Development team at the Google offices in San Francisco.

zu employs various modes of automated software testing. zu says: "We frequently unit test our application code with language-specific test frameworks, as well as develop functional tests using tools such as Selenium, WebDriver, Nightwatch.js, and others. We load test our applications using open source tools such as Apache Bench, Siege, and various cloud-based tools."

zu as Digital Partners

zu is an ideal partner for Akwesasne's Smart Cities solution because they offer skills in determining right direction, they have capabilities to build digital products that are required for the vision and they will provide long-term stewardship for the digital systems they have built. They also provide Design Thinking expertise which zu uses to design non-digital process and components, which is a proven method for creating things that will be well received by end users, as they are so much a part of the process of their development.

Here is a sample of the types of major projects and transformational work zu has accomplished in the past 24 years of their existence.

MOBILE AND MOBILE/DESKTOP PLATFORMS

From the development of the TimmyMe iOS App for Tim Hortons' in 2008 on the iPhone, which made sense with the advent of geo-location services, through the years of Blackberry development and its fall from favour. Now into Android development, as well as mobile responsive (or simply 'responsive') design, zu moves into the latest technology. But they always program

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for the purpose, not just to use a new technology. Currently, zu uses strong skills in iOS, Android and responsive web design to produce and maintain products for a variety of clients. Some projects of note include:

MYSASK 411 PLATFORM

Rebuilding Mysask411 Mobile and Desktop systems from the core (Term: 2013- Present)

Directwest built a 100-year legacy on connecting Saskatchewan buyers and sellers. The phonebook they produced served as the principal source for customers seeking and connecting with local businesses. As times changed, Directwest modernized its business offerings with a suite of digital products and services intended to keep pace with global technological innovation. Along with traditional industries around the world, however, Mysask411's user experience came up against disruptive digital headwinds and competition. The web and mobile versions of the Mysask411 platform struggled to perform on modern devices and needed to be rebuilt. Speed and performance were major issues. The web version and mobile applications had to address both mounting technical debt and a dated user experience.

The Mysask411 platform needed a renewed user experience, informed by users and built to last and adapt. zu was brought onto the project in August of 2013, and has since completed dozens of projects of large and smaller scale to improve the functionality and effectiveness of the suite of services the Mysask411 offers. In addition, zu uses Design Thinking with both DirectWest senior management teams and product teams to identify opportunities for service expansion, which are collected in project backlogs. These are then evaluated and developed on a priority ranking. zu is firmly part of the DirectWest team serving as a digital strategist, developer and long term optimizer of the suite of applications.

HELP ME TELL MY STORY / HELP ME TALK ABOUT MATH

Education Assessment System and iOS application (Term: March 31st 2016 - March 31st, 2019)

The Help Me Tell My Story education platform is another major achievement as an iOS and web system development that also incorporates Indigenous culture. The combination of technologies is similar to what will be deployed for Akwesasne. It has many levels of administrative access and collects data while optimizing the mobile user experience for the end users, who are children.

The Help Me Tell My Story assessment, which takes place by the children interacting with amusing gamified tasks, uses a holistic approach to measure oral language development for Prekindergarten and Kindergarten children. The Help Me Talk About Math application similarly uses a holistic approach to assessment to evaluate grade one students' understanding of seven mathematical processes: communication, making connections, mental mathematics and estimation, problem-solving, reasoning,

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and visualization. Both collect data from the children, their caregivers, their teachers, and Elders in their community and provide immediate access to results for educators and caregivers through easy-to-use web-based tools. The overall purpose of these assessment is to help create a real and measurable change in oral language development and real and measurable change in the mathematical process development of children across Saskatchewan.

Both these systems are extensible for other curriculums and are being extended to have French language versions. The systems have also been made available to other jurisdictions — as is intended with the Akwesasne Community Application — and the general public via the Apple App Store, though without the administrative functionality. zu continues to be a transformative digital partner for the Government of Saskatchewan, Ministry of Education.

Other Notable zu Applications

Here is a brief list of other projects requiring mobile application/web application combinations, as will be required for the Akwesasne project.

TIM HORTONS

TimmyMe iOS Application

When it was first launched, TimmyMe quickly became the top downloaded free iPhone app in Canada and Tim Hortons took notice. With over two million users, the app featured GPS to direct folks to the nearest Tim's drive-thru and included a notepad for taking orders from your co-workers.

SASKATCHEWAN ROUGHRIDERS

iOS Application

zu's created various digital solutions for Saskatchewan's favorite CFL team. In partnership with SaskTel, they took the Roughriders mobile with iPhone and Android apps that deliver schedules, standings, player profiles and stats, news, Twitter integration, videos, live radio streaming, shopping in the RiderStore and more. Rider Nation responded with over 100K downloads in the first year and over 3M sessions, leading to a 52% increase in orders and a 40% increase in customers.

MACKENZIE ART GALLERY

iOS Application

Mackenzie wanted to be a gallery for the 21st century, so zu was brought in to devise ways to use mobile technology as a catalyst for generating discussion, driving foot traffic, and connecting people to art like never before. Now their app is as much a part of the gallery experience as the physical gallery, helping people discover and engage with new exhibits and the permanent collection.

VITERRA MOBILE

Application Android and iOS

Buying and selling of crops require accurate information, and farmers may need that data while literally standing in the middle of a field. Going beyond providing up-to-date commodity prices offered at terminals, zu also created a

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nitrogen calculator so that farmers could work out their fertilizer needs on the fly. Users can change criteria, toggle results and, ultimately, make informed decisions. Viterra, like the farmers, understood how technology helps people work efficiently and effectively. This responsive website and web app, drawing on Viterra back-end systems for data feeds, experienced 434% first-year growth, representing 25,000 total hrs spent in the app in 1st year with half of all users accessing the app daily, and one-third spending 1-3 mins per session. The zu team was delighted to help them engage with the global farming community.

Approach to future-proofing the technologies (i.e safeguards against vendor-generated proprietary constraints and obsolescence, a workforce that is able to implement and operate the technologies and systems going forward.

Ensuring high quality and extensive customizability, the Akwesasne Community Application will be built as a Native mobile-web application. Native apps are built for specific platforms (iPhone, Android) and are written in the languages the platform accepts (for example, Swift and Objective-C for iOS apps and Java or Kotlin for native Android apps). Native apps are fast and responsive, distributed in app stores, offer intuitive user input and output and don't require an internet connection. In addition, native code is non-proprietary, has an army of developers at our disposal, and is free to use.

Though this is not a frequent occurrence for zu, transition of projects to alternative service providers does happen, and zu is ready by design and choice of frameworks to not have proprietary blockers preventing other suppliers from being able to take over custodianship of the systems they've built. Recent examples of projects being transferred away from zu include the planned-from-the-start repatriation of the Drupal-based City of Saskatoon websystem; and the repatriation of the PotashCorp websystem — after nearly 20 years of internal zu management — to the new Nutrien management team. (In both these cases, the relationship continues with zu being invited to contribute to new initiatives). In all cases of project repatriation, a transition plan is developed in consultation with the client on how to best setup the environments necessary for maintaining system health long-term and to provide the client team with strategies to maintain and optimize the system.

System longevity

Achieving long-term value from any digital asset requires a commitment to supporting the software development lifecycle. The increasingly rapid pace at which mobile and web technology evolves, and best practices, online threats and user expectations change make it hard to keep up. zu's support and optimization model is designed to keep the Akwesasne team aware of issues affecting application health and security. They will also keep us on track regarding opportunities for iterative

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enhancements and to take advantage of new trends or technologies, as they do with their other long-term clients.

ZU SUPPORT AND ENHANCEMENT SERVICES INCLUDE:

Support: Emphasizing continual testing and proactive analysis of known security threats and asset risks.

Optimization: Focusing on keeping pace with modern devices, browsers and operating systems impacting the performance of the platform for users.

Continual support and optimization go hand-in-hand to ensure our digital assets' long-term viability is maintained. zu's technical expertise and development processes make future adaptations such as API development, continued system integrations and reengineering cost-effective and made with ease. Services include:

- Monthly browser, OS and device testing
- Host environment performance measurement
- Optimization backlog development
- Major risk assessment and resolution
- Quarterly reporting
- Continued system integration
- API creation
- Design heuristics review
- Digital brand alignment

zu understands that the development of web-based tools and mobile applications can leave companies feeling handcuffed in their ability to operate systems going forward. Prior to completion of the Services, Akwesasne and zu will put in place an agreement zu for the maintenance and support of the Akwesasne Community Application; the agreement in Appendix A.

TECH EXPERIENCE OPPORTUNITIES FOR AKWESASNE MOHAWK FIRST NATION

Looking further into the future, this proposed digital eco-system will introduce the Akwesasne community to opportunities to take part in new technology in their community, both for those with existing expertise and those who hope to develop skills.

The Mohawk Council of Akwesasne works closely with the Ontario Emerging Jobs Institute (OEJI). OEJI is a unique offering that provides instruction from industry leaders and hands-on training for jobs of the future. Students train for the growing demand for skilled workers in areas identified as high need including topics such as web development, digital marketing, social media marketing, artificial intelligence, graphic design and search engine optimization. Currently, of the 160 students attending this program, 11 are from the Akwesasne First Nation.

The Mohawk Council of Akwesasne also currently has 15 personnel as a part of their Information Services team. This includes;

- 1 Manager
- 1 Program Support Officers
- 4 Network Analysts
- 4 Hardware Technicians
- 3 Software Analysts and 2 Help Desk Technicians

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The team supports provides a range of IT services to all departments and programs within MCA including the Akwesasne Mohawk Board of Education. Information Services oversees the maintenance, repair, upgrade, etc. of more than 800 computers and 25 individual networks and one wide area network. The Software Analyst team supports 75 different specialized software, some of which are built programmed in house. We feel we have the technical and human capacity that is able to implement and operate the proposed technologies and systems going forward. There will be opportunities for zu to train our team to the extent we find appropriate, knowing that zu could remain as principal stewards of the systems, or as helpers, or could be completely replaced by the Akwesasne team, at our option.

How the technologies comply with relevant legislative and regulatory requirements

LEGISLATIVE REQUIREMENTS

In Canada, mobile applications are regulated under the Personal Information Protection and Electronic Documents Act (PIPEDA). The Act, enacted in 2000, governs how private organizations collect, use and disclose personal information. MCA and zu commit to comply with all applicable laws regarding the protection of personal information including PIPEDA. Please reference our Preliminary Privacy Impact Analysis for in depth analysis.

FLEXIBLE DEVELOPMENT STANDARDS

Our Smart Cities Solution currently presents limited interoperability between technologies such as existing community systems, services, and infrastructure. However, our partner zu is well-versed creating necessary interactions (such as have been necessary in their past projects with many types of interactions) and uses due diligence in all expected and potential integrations. A few instances of interoperability have been identified and will be explored in the next phase for development. These include:

- Requesting, Tracking and Paying for MCA's Smart Taxi service within the application
- Ordering, Delivering and Paying for Greenhouse produce, and the 'Green Food Box' within the application
- Integration and interoperability with third-party fitness and health tracking applications
- Future interoperability with Telus health.

RIDE HAILING SERVICES & SMART GREENHOUSE INTEROPERABILITY

When developing our public transportation system and integrating it with the application, there are three pieces of interoperability requiring third party software and frameworks. First off, like other ride hailing services, (ie. Uber, Lyft, Instacart), our app requires access to the CoreLocation framework. This allows individuals to both request rides and share location addresses with a driver

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through geolocation, and order groceries to their specific location. This framework provides classes and protocols to configure and schedule location delivery and send location events to the server. The CoreLocation framework also lets our application define geographic regions and monitor a device's movements as it crosses defined boundaries. Secondly, to display point-to-point directions on a map within the app, iOS developers use a Framework called MapKit. Registering the app as a routing app then makes directions available to the Maps app and all other mapping software on a user's device. Android routes and directions, however, are made possible by the Google Maps Android API. Thirdly, to use a cashless system that allows credit and debit transactions and so remove all risk of human-to-human cash transfers — we will interoperate with one of two leading companies in the mobile payment market, Braintree or Stripe. Both payment frameworks are used by current, emerging and established companies and follow both the Code of Conduct for the Credit and Debit Card Industry in Canada, as well as PIPEDA.

FITNESS AND HEALTH APPLICATION INTEROPERABILITY

With health and fitness applications extremely prevalent today, understanding the interoperability of default and leading health applications will maximize the advantages of integration with them. To ensure the Akwesasne data is stored and managed exclusively under MCA Information Services we investigated the leading brands in health and data tracking. We need to understand the complexities and privacy concerns of the applications we intend to use, such as Apple Health, Google Fit, and Samsung Health, as well as the wearables offered by Fitbit, Garmin, and Apple Watch. Google Fit was subsequently quickly dismissed due to the requirement that any app that reads Google Fit data must also store any collected health data with Google.

APPLE HEALTH

Apple Health provides operating system level storage for health/fitness data through a framework called HealthKit. Apple's intent is for 3rd party app developers to create apps that integrate with HealthKit to make "rich" fitness data available to both the Apple Health App and HealthKit. Any app can request permission to read/write a number of different types of health information based on a large list of "categories" provided by Apple. Once fitness information is stored in HealthKit, it's essentially available to any app that the user grants access to read from HealthKit. While the HealthKit framework appears somewhat complex, it's capable of surfacing any data recorded by the Health App, or any other "service" (tracker apps), both as granular data and aggregate statistic. This is all good news.

SAMSUNG HEALTH

Samsung smartphones come with the Samsung Health App (aka "S Health") pre-installed. The Samsung Health app is also freely available on the Google Play store for installation on non-Samsung devices. In many ways, Samsung Health is analogous

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to Google Fit, but with two key distinctions. Any application that wishes to read/write/share data with Samsung Health must be approved as an official Samsung partner application. Unlike Google Fit, no Samsung account is required to use Samsung Health, though Samsung promotes the creation and use of an account to sync/backup data to Samsung's cloud service, and to make data available across multiple devices.

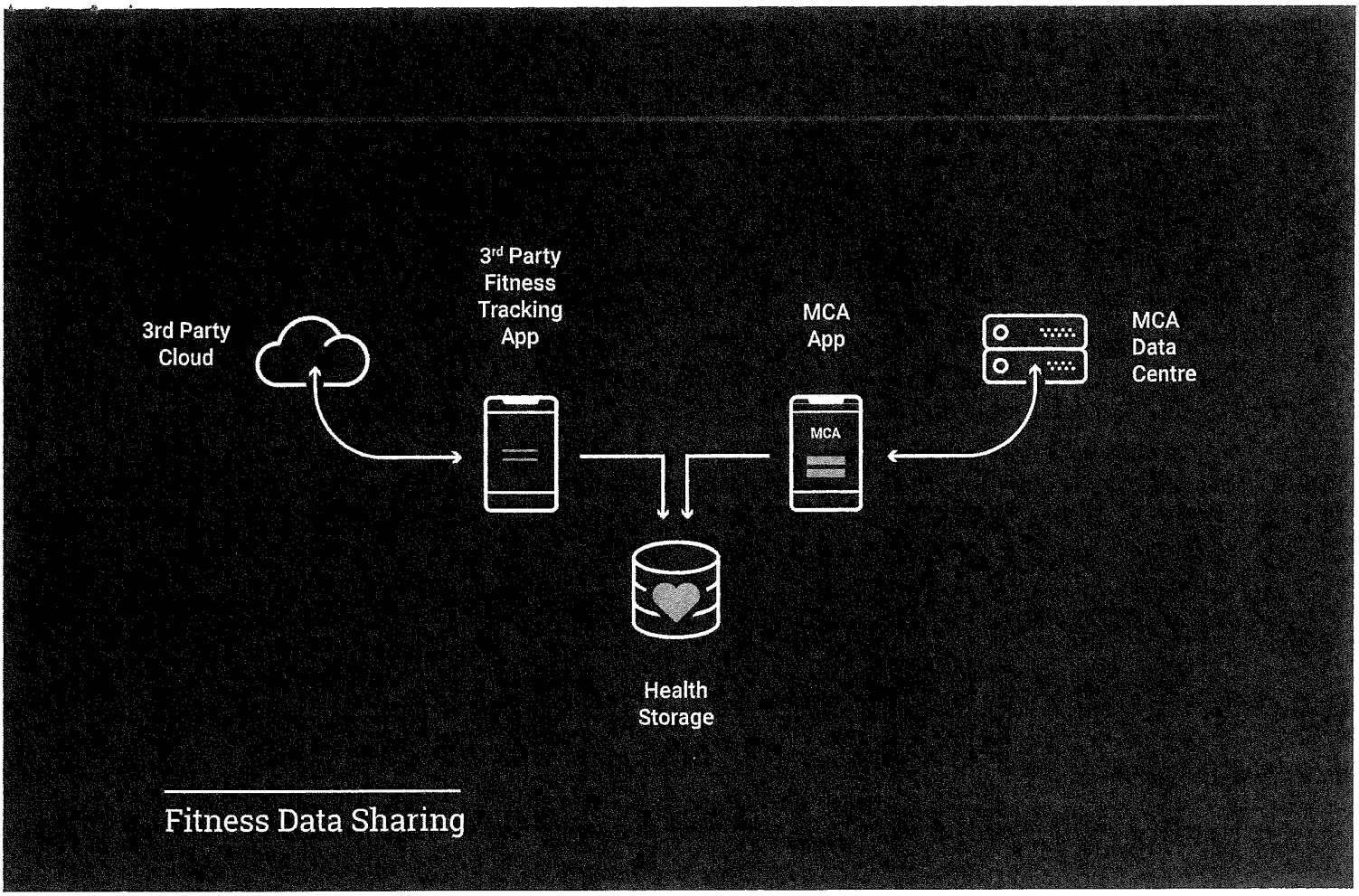
In conclusion, the health app ecosystem for Android is, unfortunately, more fragmented than iOS. There is no analog to HealthKit (operating system level storage) for Android, and it's up to individual apps to be responsible for the storage and sharing of health data.

WEARABLES

- Fitbit does not directly integrate with Apple, Samsung, or Google health apps, though fitbit does allow access to data through a web-based API.
- Garmin provides a Garmin connect app for both platforms and so can sync data to any of the health apps discussed above.
- Apple Watch does not provide health tracking on its own. Rather, it relies on "WatchOS" extensions provided by applications installed on accompanying phones that can read and store biometrics to Apple Health.

With this background in mind, we plan to make use of Samsung Health (Android) and HealthKit (iOS) systems. We can then migrate the data users are currently tracking on their devices while maintaining a familiar user experience for individuals comfortable with their current applications. Privacy concerns remain at the forefront of our build; as stated, MCA and zu commit to complying with all applicable laws regarding the protection of personal information such as that found in The Personal Information Protection and Electronic Documents Act. Privacy is also key to earning the trust of users, as their engagement and acceptance is also a key measurable for our initiative's success.

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Fitness Data Sharing

TELUS HEALTH INTEROPERABILITY

The Mohawk Council of Akwesasne is in preliminary talks with Telus Health to implement their proprietary software throughout all Canadian jurisdictions. The opportunities and capabilities of this homegrown system is interesting but needs exploration. Further research and discovery will need to be completed during the strategy phase of implementation.

REPLICABILITY ACROSS CANADA

We suspect that the factors contributing to a higher prevalence of diabetes in the Akwesasne community hold true for all Indigenous communities across Canada.

If we succeed in having a real impact on health outcomes in Akwesasne through the areas of focus we have piloted, we will be open to having our approach and software replicated for use by other first nation communities. We are energized by the possibility of improving the health of other communities via our Smart Cities approach to targeting causative factors we suspect are consistent culprits. While the software may be directly applicable to other communities as it stands upon completion, some degree of customization will undoubtedly be necessary for its deployment, given the specifics of that second situation. Ideally, a consistent

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core could be maintained so those future improvements could be rolled out amongst all future users.

ROLES AND RESPONSIBILITIES OF TECHNOLOGY PARTNERS

The role of zu in this project includes helping our team collaboratively identify the strategic direction, providing the design for products and services including the development/programming and support of the Akwesasne Community Application, and it's integrated systems. Within our governance structure, prior to selection of both the Greenhouse System & Electric Public Transportation System technology partners a public tender will be requested for both personnel and strategic implementation.

IDENTIFICATION OF RISKS (E.G PRIVACY ISSUES, CYBERSECURITY BREACHES) AND DEVELOPMENT OF APPROPRIATE MITIGATION STRATEGIES

No Internet technology is risk-free. However, as we intend to program to best practice standards, and follow the available standards for privacy, system security, data back-up and so forth, we will reduce risk to the acceptable baseline all Internet-based systems face. At this time there are no known risks in the implementation of technology particular to this project.

ACCESSIBILITY AND USABILITY OF THE TECHNOLOGIES TO DIVERSE USERS, RESIDENTS AND OTHER STAKEHOLDERS THAT SUPPORT THEIR UPTAKE AND ACCEPTANCE.

Web Content Accessibility Guidelines (WCAG) 2.0 and Authoring Tool Accessibility Guidelines 2.0 covers a wide range of recommendations for making web content more accessible. Following these guidelines makes content accessible to a wider range of people with disabilities, including blindness and low vision, deafness and hearing loss, learning disabilities, cognitive limitations, limited movement, speech disabilities, photosensitivity and combinations of these. Following these guidelines will also often make your web content more usable in general. (http://www.w3.org/TR/WCAG20/)

Each page and feature will be developed with an understanding and incorporation of Web Content Accessibility. Some key elements of the guidelines include the 'Skip to Content' link which allows people to quickly access content by skipping primary and secondary navigation. A redeveloped application will also be screen reader enhanced optimizing the site for visibly impaired individuals. Appropriate contrast will need to be designed between links, text, images and any user interface elements on each page.

zu's team has relevant experience in developing websites and mobile platforms within these guidelines.. From these projects, zu has learned best practices that will be transferable to Directwest. Throughout development, zu will test the mobile platform to ensure that it is meeting level AA Web Content Accessibility. We will also be sure to use the Authoring Tool Accessibility Guidelines 2.0 for content created and migrated to MCA.

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Governance

GOVERNANCE FRAMEWORKS AND STRATEGIES TO OVERSEE AND MANAGE PROJECTS, PROJECT RISKS, FINDS, AND PARTNERS THAT ARE RIGOROUS, TRANSPARENT, EFFECTIVE, AND PROVIDE VALUE FOR MONEY

Since the late 90's MCA has been in a Nation Building process, a process that allows for the investigation and negotiation of a draft Akwesasne Governance Agreement. The process was initially termed a Nation Building process and has since been renamed Entewatathá:wi or "We Will Govern".

The overall goal of this process is to investigate the extent of Canada's commitment to negotiate a Self-Government Agreement specific to Akwesasne where MCA exercises jurisdiction. Entewatathá:wi has been working towards establishing the laws, regulations, policies, practices, and institutions that will govern the northern territory of Akwesasne. The Road to Self-Governance Negotiation of a final agreement on Governance will provide clear formal recognition by Canada of Akwesasne's governance institutions and address the relationship of Akwesasne's and Canada's laws. Negotiations have also begun with Ontario and Quebec on some jurisdictional issues. Self-Governance is a long and grueling process that involves negotiations with the government of Canada, our own local governments and leaders, educating and consulting our community and making sure we protect our inherent rights as Akwesasronon. Ultimately, it will be our community that determines whether or not to accept the negotiated Akwesasne Governance Agreement by holding a community referendum.

- Governance / Council Portfolio's include:
- Department of Technical Services
- Akwesasne Mohawk Board of Education
- Executive Services
- Department of Health
- Department of Housing
- Department of Justice
- Public Safety
- Department of Tehotiiennawakon
- Tehotiiennawakon - Environment Division

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Mohawk Council of Akwesasne Carries out projects with at least three personnel involved, Manager, Assistant, and Technician. Project timelines are created with project management theories. Regular project meetings are held with key personnel involved, this includes outside contractors. Mohawk Councils Finance policy requires 3 quotes for anything purchased over 1000.00.

- Managers can sign off up to 5000.00.
- Directors sign up to 50,000.00 with mandatory RFP process.
- The Executive Director signs up to 100,000.00.
- Any Contracts, payments over 100,000.00 must be processed by a Mohawk Council Resolution(MCR). There are 13 chiefs on council and 7 are required to sign in agreement of a decision through the MCR Process.

In working with clientele, their partners and unique stakeholder groups over the years, zu have some proven ideas on governance that can assist in our process as well. As a partnership we believe strongly in the benefit of open communication but recognize the need to focus the collaboration where possible. Before project kickoff, key client decision makers and approved deadlines will be revisited and finalized.

STRATEGY

Typically projects are built in phases with initial consulting and strategy leading to a deliverable such as a communications brief, information architecture, low-fidelity concept sketches or an experience prototype in the form of wireframes or a mobile prototype for user testing. During this phase, the client's Project Coordinator (PM or Manager) will help coordinate meetings, demonstrations and communicate feedback and approvals at our Product Owner, who is the main point of contact from kickoff to launch. The client's Project Champion (Director level) will be available to provide insight during consultations and liaise with executive and board members who require visibility. An Executive Sponsor (Executive Member) or Committee is often involved early on to set direction with our team but will be consulted throughout the phase to ensure objectives are being met.

PRODUCTION DESIGN AND DEVELOPMENT

Once the direction is set, active production begins with weekly demonstrations of progress as outlined in the project timeline. The Project Coordinator and Project Champion will be required to attend these meetings to provide input and liaise with executive and board members who require visibility. An Executive Sponsor or Executive Committee will be consulted throughout production to ensure objectives are being met at key milestones outlined in the project timeline.

Deliverables will be submitted to the client's Project Coordinator for internal feedback. Any approvals or sign off will follow in weekly production meetings creating a feedback loop from the start of production design and into development. Once development demonstrations begin,

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a Technical Lead (Client IT Group Member) will join the client's team to coordinate integrations, flag risks and provide materials and support to our developers if required.

Finally, active user acceptance testing will be performed within the feedback cycle and then again prior to launch. By the end of the project, end-to-end testing will be completed internally at zu and on the client side to reach final approval. Once the product is approved, the asset will go through predefined steps for launch as outlined in the project timeline.

ESCALATION

Throughout the entire process, from strategy to production and launch planning, any issues that require escalation beyond weekly project meetings will be addressed with the Account Manager by the client's manager/director representative. If unresolvable, issues will be escalated to the Executive Sponsor by the client's executive team member.

Details about the partners and their role, capacity and readiness

zu is our only major partner defined through the Smart Cities Challenge. They build digital products and services and uses a design strategy to drive innovation within organizations. Founded in Saskatoon in 1995, zu is a happy, motivated team of 35 confident in achieving success on every project and committed to working with clients building modern solutions for mature industry problems. zu's team is a mix of Design Thinking experts, analysts, production designers, developers, IT and client support specialists focused on building tools that are informed by users and meet client business objectives. Their services are grouped to correspond with the lifecycle of digital products.

Collectively zu has the bench strength and the decades of experience to hit home runs on big, challenging projects. Our technical depth and our cosmopolitan appreciation for style and elegance are focused by our adhesion to the user-centric approach to design. Our plans are therefore on target, our ability to execute proven and not easy to replicate, and the result for the MCA application and Smart Cities Challenge project will embody a balance between being uniquely engaging, practically sustainable and innovative. Our combination of youthful design, project sensibility and decades of programming experience, deployment and support means the best of all worlds for the Akwesasne web system, especially when it comes to creating something for today and for tomorrow.

RISK MANAGEMENT APPROACH

The goal of our risk management is to decrease the chance that we don't deliver working software to a happy client. We want our client to have participated in choices involving adding or chopping features and scope so that the most important features are accomplished on time and on budget.

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To assist with managing risk throughout projects, zu utilizes a Project Status Report. This document allows MCA and zu to communicate and provide weekly project status updates during client demos. We can highlight milestones, design concepts or major features and flag them if there is an issue, or if everything is on target. This will also highlight past accomplishments, key activities for the next week and upcoming issues that should be addressed early. We can track all decisions that impact the project, along with a budget update.

Communication is critical for project success. Our approach is to maximize project visibility with clients and form a tight-knit relationship with our project leader, the Product Owner. We document these plans in a project charter before kickoff. This document acts as a reference for key decision makers on the production side and the client side. It includes key milestones and project objectives. Put into action, our Product Owner becomes our client's main point of contact for ongoing production and flagging any issues, risks or challenges as they come up.

The myth still exists that software and complex systems can be planned out like building a bridge. That Gantt charts and timelines and feature sets are predictive of project success. This is not so, and is proven in the terrible track record of software projects that have failed, even though all these risk-reducing factors were in place.

zu has long ago recognized the importance of the Agile method for software building that accepts lack of predictability and instead focuses achieving project success by accomplishing important things first, by allowing the scope to be modified to make the most effective use of the constraints of time and money, to recognize dead-ends quickly and double down on good ideas that arise in the process of building. Transparency and approval for what is being done, what is done and what will be done are discussed in sprints with the client at regular and short intervals.

EVIDENCE AND DETAILS ABOUT THE PARTNERSHIPS, INCLUDING THEIR NATURE, TERMS, ACCOUNTABILITY STRUCTURE, AND FINANCIAL REQUIREMENTS.

On the 30th day of September 2018 The Mohawk Council of Akwesasne and zu.com communication Inc. entered into a contractual partnership between client and consultant. Please refer to the confidential annex for our Master Service Level Agreement and Memorandum of Understanding during the Finalist phase of the Smart Cities Challenge.

APPROACH TO PARTNERSHIPS THAT RETAINS COMMUNITY CONTROL OVER SENSITIVE AND PERSONAL DATA

Although zu is the contracted firm to build the technical aspects of the app/web portal, Mohawk Council will own the rights of the system and house and retain all data created with the system. All data collected, used, and disclosed will be managed under the Mohawk Council of Akwesasne stored on MCA internal data centers and servers. Please refer to our Preliminary Privacy Impact Assessment for an in-depth analysis of information privacy.

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Engagement

APPROACH TO ENGAGING WITH, GAINING ACCEPTANCE FROM, AND ONBOARDING RESIDENTS AND OTHER STAKEHOLDERS FOR PROJECTS THAT ENSURE ONGOING ALIGNMENT BETWEEN THE OUTCOMES AND THEIR CONCERNS AND NEEDS.

In order to understand where we are going in the implementation phase, it is important to understand where we have been over the Finalist phase. As strong believers in human-centered design, and designing with users and for your users, we have put Community Engagement at the forefront of our Smart Cities Challenge solution.

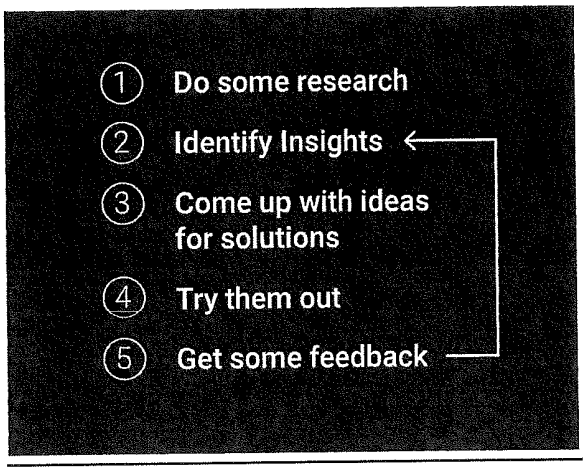
Over the past several months, we facilitated workshops with inclusive user groups, interviewed internal and external stakeholders, hosted community engagement events, and surveyed and user tested our prototypes with Akwesasne community members. The 5 stage approach brought by Design Thinking was executed by our partners at zu through a series of trips to our community. We completed the recyclable model several times to come to the prototyping and feature prioritization of our Community Application, narrow in on our Smart Greenhouse concept from several implementation ideas, and understand the true needs of the community for the execution of our Electric Public Transportation System.

To ensure a substantial amount and quality of community engagement, we leveraged the Design Thinking methodology and process, which is a **practical approach** to finding **creative solutions** to problems, inspired by traditional design methods, or more simply, an approach to problem-solving, which we will dig a bit deeper into and outline below.

"Thinking like a designer" means leveraging empathy, experimentation, and often technology, to produce solutions that help real people. Design Thinking is heavily rooted in Human-Centered Design, which emphasizes a user-first approach: finding out what users really need, then balancing solutions for those needs with the possibilities of technology, and requirements that define success for the business.

Several popular Design Thinking structures have emerged over the years. Most have the same basic underlying model:

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A common Design Thinking structure

1. Do Some Research

Research is critical to Design Thinking. Gathering information about a problem helps define the problem (or more typically, problems), so we can determine what the right problem is to solve. Design thinking research takes the form of interviews, usability testing, surveys, looking at analytics, and so forth. And research never really stops as feedback goes back in the top and then becomes the subject of feedback once more.

To ensure we look at user needs from multiple angles, we follow four research themes.

About Them - Takes the form of indirect research about Akwesasne and our community members living here. We looked at existing internal data, industry and community reports, and aggregated data. This indirect research included:

- Akwesasne Satisfaction and Experience Surveys
- Akwesasne Cultural Orientation Guides
- Mohawk Council of Akwesasne Department of Health - Annual Reports
- Mohawk Council of Akwesasne -Healthy Eating and Active Living (HEAL) Program - Indicator Reports
- Mohawk Council of Akwesasne - Strategic Plan
- Mohawk Council of Akwesasne - Comprehensive Community Plan

With Them - The most common method of "with them" research — or "with Us" in this case — is a simple 30 to 45 minute 1:1 interview in person or on the phone with the interviewee. "With them" interviews were undertaken with our community members themselves and also with groups and individuals that regularly interact with community members. In the finalist stage of our work, our "With Them" research included interviews with many distinguished individuals including:

- Amber Montour (Manager, Wholistic Health)
- Sarah Thompson (RN, Supervisor)
- Della Adams (Traditional Medicine Employee)
- Lesley Bero (Program and Diabetes Prevention Manager)
- Karole Mitchell (Community Health Nurse)
- Cindy Francis-Mitchell (Assistant Director of Health)
- Andrew Francis (Data Health Management Coordinator)

During these interviews, we asked straight

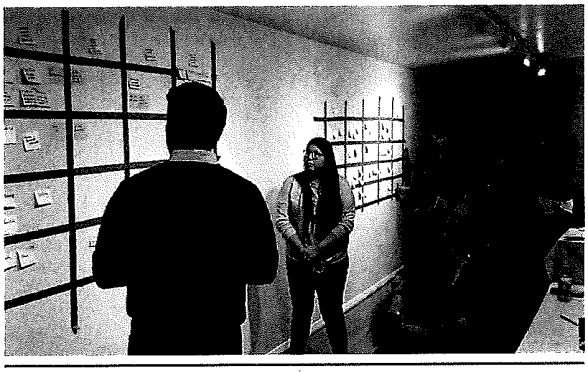
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forward, open-ended questions to gather information and insight while leaving the interview loosely scripted. This allowed our interviewers to adapt their line of questioning and vary which answers received more detailed follow up questions. We ask, for instance, What do they know about the client? Where they see their clients struggle? What questions are clients asking? What can be done to make the user's experience better?

"Be them" - The "be them" method allows researchers to gain empathy for a user's pain points by walking through an entire journey exactly as they would experience it, from start to finish, in the most natural context possible. As a part of our research phase we had MCA employees take us through their diabetes journey. Each journey started with being screened for diabetes, to find out if they were free of symptoms, pre-diabetic, or diagnosed diabetic. Then it was understanding the implications of their assessment, and how they were to manage their life in each case for the long term. This led the research team to an understanding of their journey, all the user's actions, touch points, thoughts, and emotions experienced by the individual through the process, often including their family's experience with the individual's journey. In approaching any particular event or process as a journey, fewer possibly important elements will be missed. More details will be noted this way, when subjects are asked to tell a story exactly how they walked through it, rather then if people are simply asked to describe what they remember about an experience.

2. Identitfy Insights

Once we finished the research stage, we sought to extract meaning from it. Pulling insights out of our research, and choosing the really important ones is an incredibly valuable step in setting the stage for effective ideation. Many folks typically want to brainstorm on ideas without adding new nuggets of information to the conversation, and so get nowhere new.



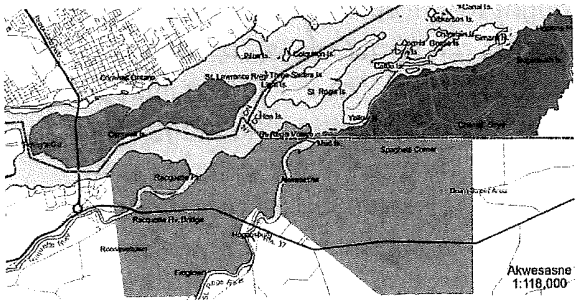
Journey Mapping workshop with Akwesasne community members and stakeholders

But Design Thinking has us start with a load of information, and then provides methods to identify insights efficiently and collaboratively. These insights then feed the creation of really innovative ideas. In our workshops with MCA stakeholders we used the techniques of the practice, we group shared and affinity mapped to identify patterns and themes. We wrote and edited challenge statements to concentrate on the most important underlying challenges of diabetes.

Our preliminary research and stakeholder workshops led us to the following key insights.

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Key Insights



Map of Akwesasne and it's districts

FOOD INACCESSIBILITY

Inaccessibility to healthy food alternatives in Akwesasne is two-fold. First, our traditional Mohawk diet was based on growing, fishing and hunting, but has been severely damaged by pollution. Mercury levels are high in both the Saint Lawrence River and the surrounding soil. Community members have been cautioned to limit their diet of locally caught fish to one per year! We are told our traditional farming practices may produce unsafe food when grown on the polluted soil of Akwesasne. Second, due to the jurisdictional impediments, with border crossings causing delays in both direction of travel, healthy groceries and produce for many families can be up to a 30-minute commute away. With many community members living without vehicles, and with a scarcity of public transportation on the reservation, getting proper food regularly can be almost an impossible feat for many.

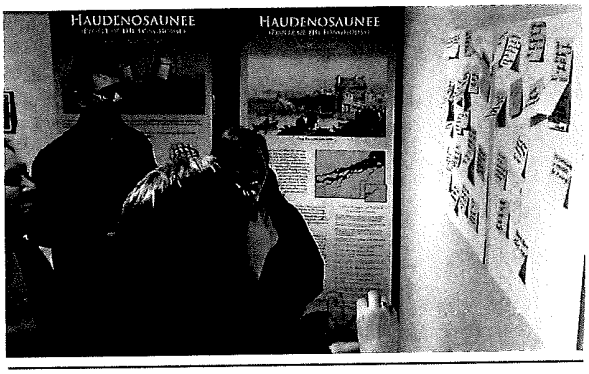
NETWORK ACCESSIBILITY

Being in a rural area of Ontario, the Akwesasne First Nation finds itself with insufficient mobile network capabilities. In all 3 districts, our community expresses frustration with so-called "dead zones" in many areas. This lack of contact creates barriers to our members receiving information regarding events, community activities, or communication for transport. Recognizing the value of our current efforts that made us a finalist of the Smart Cities Challenge, the Mohawk Council of Akwesasne has plans to leverage our efforts and take this as an opportune time to update Akwesasne's mobile infrastructure. Using their own internal budgets, the Mohawk Council will actively support the development of the Smart Akwesasne solution by providing necessary infrastructure.

TRANSPORTATION ACCESSIBILITY

Lack of public transit, combined with the lack of personal vehicles for many, makes it extremely difficult for Akwesasne people to gain access to opportunities offered in our three principal communities. As spoken to above, the opportunities we are most concerned about for community members are accessibility to food, to health services, to fitness locations and activities, to community events, and to other social services. With the implementation of our Smart Cities solution we will create accessibility to these opportunities. With the Smart Cities project in place our people will enjoy the possibility and option of traveling between districts, and with minimal financial burden. Accessibility has been determined to be one of our key strategies to reduce new cases of diabetes in the community.

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Ideation Workshop on 'How Might We' statements with Akwesasne community members

WESTERNIZATION

Since the imposition of Western culture on our community, the Mohawk people have been subject to drastic change in their daily diet. First, many community members have moved away, not just from their home territory, but from their traditional lifestyle and food sources. There they are eating the fatty and carb-heavy alternatives that are convenient and cheap, whether from chain restaurants or other seemingly economical options. Second, the fast-paced, consumption-oriented lifestyle now everywhere is still very new to our culture. Healthcare workers, particularly those involved from a diabetes prevention/ management point of view state, observe that the people of Akwesasne are practicing less and less the holistic and traditional approaches to medicine. Our people increasingly have come to accept the disease that comes with westernization and western ideas about health. We become used to taking pharmaceutical drugs to combat metabolic and diabetic disorder, rather than look for answers in our traditional approaches to health.

CHECKUP FREQUENCY IN HEALTH & DENTAL

It is apparent that community members, particularly men, do not see a doctor regularly. This of course contributes to poorer health outcomes. Many factors may be in play with this behaviour including: pride and the desire to show strength; a genetic predisposition that allows Mohawks to actually handle pain better than others; the absence of a male doctor within the community. Again, lack of options for public transportation also plays a key role in this exacerbating this unfortunate infrequency of interactions with health and dental services.

HEALTHCARE SYSTEM DISCONNECTION

Further difficulties arise from the complicating reality that Akwesasne people and their families —though one community of Mohawks — live in 3 jurisdictional areas: Ontario, Quebec and the state of New York where they are dual-citizens. It is not hard to imagine the complications this causes our own internal health care efforts: having to interact with three separate systems none of whom are recognized for ease of use. Our people may be using health and dental services from multiple institutions located in different jurisdictions. And so we find many of our health client's records to be inaccurate and/or incomplete. This causes an overall lack of transparency, and makes difficult our ability to even assess where we are as a community health wise. Issues in terms of data consistency, information collection and information aggregation make it difficult to even begin to interpret the overall system's performance in a holistic way. How will we

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find insights worth acting upon without good information?

The poor state of record keeping caused by these overlapping jurisdictions is extremely straining on healthcare professionals. These folks are trying to help and are striving to accurately diagnose the individuals they see. But they just don't have the basic information of an accurate medical history to work with. We need to give our health care professionals, and the people themselves, complete and accurate baseline health records. Knowing where we are as a system and as individuals is key to knowing where to go and whether we are heading in the right direction. Health assessment is based on measurable data, and the health of the system is based on measuring the improvement in outcomes. Improvements and consolidation are needed in the medical records of our people. We cannot expect that this improvement will be provided by the three medical systems we deal with. This centralization will be something we need to build ourselves. It will be important in our battle to reduce new cases of diabetes in our community.

LOSS OF TARGET DEMOGRAPHIC FOLLOWING PRIMARY SCHOOL

Individuals from 12-25 are our primary target demographic for preventing new cases of diabetes. When this cohort are in our community and in school on the reserve, The Department of Health has the opportunity to educate them. Given our people's increased susceptibility to metabolic diseases and diabetes, we have to act proactively with our young people to prevent new cases. Akwesasne is home to three Akwesasne Board of Education Elementary (AMBE) Schools. These schools include Ahkwesahsne Mohawk School, Kana:takon School, and Tsi Snaihne School. While in school our children receive instruction about nutrition and health promoting lifestyles, learning to make habits of healthy choices. Following graduation from our schools, however, our students only secondary schooling options are off reserve. Our losing access to them following primary education means we have lose our opportunity to continue training them for long term health. This insight identifies a barrier we target to overcome.

GOAL OF INSIGHTS

Our goal of identifying insights is to better define the problem(s) and understand what are we really trying to solve. Insights set the stage for idea generation. But before we generate ideas we use an interim step to reframe insights as questions.

The How Might We framework is particularly effective for inspiring creative solutions for two reasons:

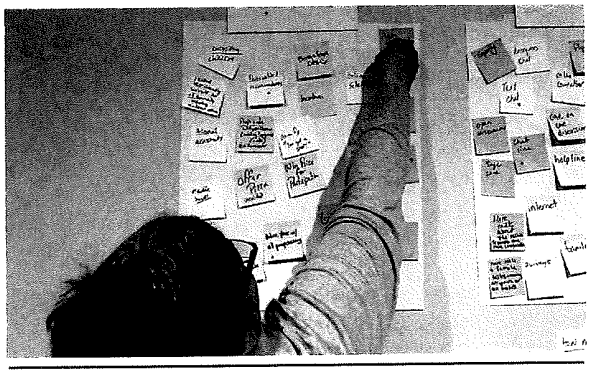
1. Its phrasing implies that a solution is possible.
2. It's often easier to craft solutions when you're trying to answer a specific question.

Collaboratively with zu, we crafted How Might We Statements. These are intended to create a road map that will lead us to generate new ideas to help the Akwesasne community.

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Our How Might We Statements included:

- How Might We reduce the time and distance to healthy food?
- How Might We create a solution that bridges the gap between traditional and modern medicine?
- How Might We make people feel more comfortable discussing sensitive topics with health care professionals?
- How Might We maintain health education and contact with our people through High School?
- How Might We motivate people to take advantage of existing programming?
- How Might We encourage people to get screened for pre-diabetes earlier?



'How Might We' Statements being explored during Akwesasne community workshop

3. Come up with some ideas for solutions

Referencing our How Might We Statements, our next step was coming up with ideas to solve them. There's seemingly no end to the number of ways to approach idea generation (aka brainstorming or ideation). Ideas can be generated individually, as a group, or both. Ideas for solutions can be written, drawn, built in 3D, acted out, etc. The key is to focus on generating lots of possibilities, not necessarily trying to find the silver bullet solution right off the top.

Using a combination of individual and group ideation tends to result in the best solutions because:

- Individuals working alone can focus their thoughts to come up with more fully formed ideas.
- People working in a group can then use the individual ideas as springboards to evolve their own idea, build on another's idea, or come up with more new ideas.

In a small group session with health care professionals, council representatives and community members we began writing, drawing, and acting out solutions. This resulted in nearly a hundred different solutions to the above How Might We statements. We derived solutions that would make food and healthcare more accessible through various approaches including transportation improvements, diabetes prevention education (choice), cooking classes (variety). We had ideas regarding increasing programs offered that promote healthier lifestyle and provide

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fitness resources, including tweaking our competitive nature with district games, where individuals compete against one another in sport and art. We envisaged anonymous helplines for health care advice and direction. We identified the implementation of greenhouses as a good idea: they are increasingly practical to operate; they would be an educational enhancement if associated with our schools; they would increase our accessibility to healthy produce. Additionally, moving our agriculture into greenhouses would decrease our exposure to toxins in the food we have no choice but to grow in our now polluted soil.

This group session produced over a hundred ideas. Participants were energized by the opportunity to develop their own ideas, to build on another's idea, and to see their idea taken further than they imagined when the whole group contributed on theirs. We saw useful innovation happen and produce good ideas. We used Design Thinking approaches to make choices as a group. We voted on favorites to focus down on the best of the hundred. We took the finalists further and worked until these most viable ideas became prototypes.

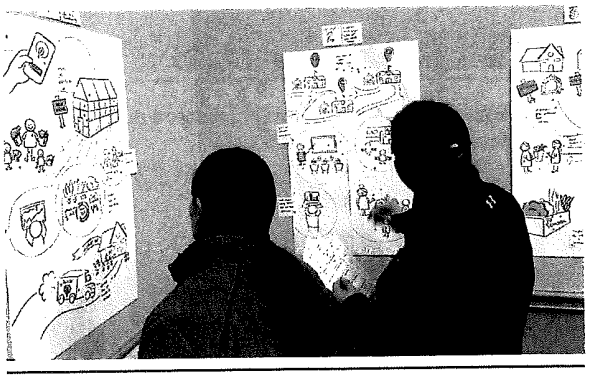
4. Try ideas out

Prototyping possible solutions is the least expensive way to fail, and the fastest way to learn. Prototypes can be digital, paper, or a combination of any kinds of materials, sometimes looking like arts and crafts. Participants can prototype a process, a pamphlet, a script. From our ideation session, we sketch-prototyped, and digitally-prototyped several concepts based on ideas we had discovered in the stakeholder engagement from our workshop.

SMART GREENHOUSE SYSTEM SKETCHED-PROTOTYPES

Through our workshops it was evident that the implementation of a Smart Greenhouse System was crucial to bringing healthy, affordable and accessible food to the community. To determine a strategy which would create the best benefit for our community, we narrowed the options down to three:

- 1 Large Community Greenhouse supporting all districts
- 3 Medium Community Greenhouses supporting each district
- Several neighbourhood operated community greenhouses supplying the homes in those neighbourhoods.



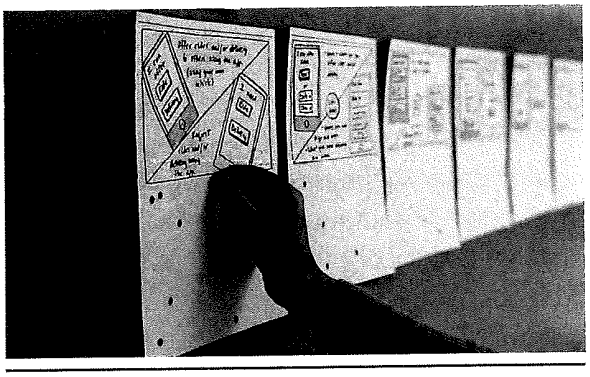
Smart Greenhouse System Prototype during community engagement

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ELECTRIC TRANSPORTATION SYSTEM SKETCHED-PROTOTYPES

Likewise, our ideation workshops made us aware that some form of transportation system in the community was going to be necessary to our Smart Cities approach. This led us to prototype multiple concepts to potentially solve this clear barrier to many of the issues we identified as insights. These transportation solutions included:

- Ride-Sharing System connecting individuals who can offer rides with individuals who need them.
- MCA operated and subsidized Smart Taxi Service



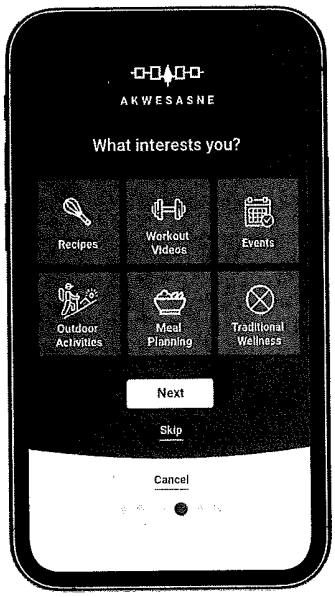
Electric Transportation System Prototype during community engagement

AKWESASNE MOBILE/WEB APPLICATION DIGITAL PROTOTYPE

In the finalist phase, a goal for the combined team was to create a working prototype of the Akwesasne Community Application. The application will allow the necessary communication and coordination for the whole Smart Cities approach to work, like glue for all the parts. Prototyping is a major milestone in the Design Thinking approach to building a product or service, as it is the artifact representing the culmination of all the previous work, and is a clear target for what the next stages seek to create. So, following Design Thinking exercises with users where features were developed by users, early versions of our application prototype was created by our partners (zu) in AdobeXD. This online, interactive version of our app allowed community members to navigate through the its functions using their devices in ways close to having a working application.

This digital prototype, a replica of the application, demonstrates initial sign up and login screens, as well as 4 tabs: Wellness, Nutrition, Fitness, and Community. Sub menus for these tabs each bring additional screens showing how these new opportunities to Akwesasne will work. The application, which is expected to expand in capability over time, provides room for expansion of functionality in future phases. With extensive engagement and feedback from the community to ensure proof of concept, followed by cycles of iterative prototypes produced and shared with each round incorporating feedback followed by more user-testing — we produced a prototype interface. On the following page is a link to the the Akwesasne Community Application prototype.

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CLICK THE LINK TO VIEW THE PROTOTYPE

https://adobe.ly/2ERy3X3

- Features and functionality of prototype include:
- Login screens with terms of use, privacy policy including collection, use, and disclosure messaging
- Ordering and payment of the Smart Delivery Service (for food deliveries from the Green Food Bag and Smart Greenhouses)
- Requesting and payment of rides from the Electric Public Transportation System
- Traditional and modern health resources in the forms of videos, blogs, podcasts, and recipes
- Booking of traditional, holistic and community healthcare appointments
- Access and storage CANRisk survey results, with prompts to take necessary action
- Compete in activities alone, or with friends in order to gain rewards
- Events and programs page to stay up to date and aware of opportunities in the community

5. Get some feedback

Getting feedback from our community on these more mature prototypes was the next critical step to ensure our solution would meet their expectations. The majority of our this wider community feedback and user-testing would be completed at our community engagement events.

We were aware of the lack of transportation limiting participation for many. So we made sure to host community engagement events in each of the three districts so there was ample opportunity for everyone to contribute to our Smart Cities Solution. For both the Smart Greenhouse System and the Electric Public Transportation System, we used a multifaceted approach to get good feedback from users. We mobilized a number of strategies:

Interviews - Members of our team and zu's were stationed around the meeting space in

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order to answer questions, pose their own questions back to users and to follow up to enquire why certain notes were given or decisions made.

Dot voting - Allowed community members to simply leave adhesive dots on parts of the solution sketch they really liked or approved of.

Feedback Notes - Gave users the opportunity to provide feedback by writing comments on adhesive notes and sticking them anywhere on the sketches. Their comments led to other participants also dot voting on the stickies themselves, giving approval or making further suggestions, all in a casually collaborative and efficient way.

Voting box - With multiple concepts and many participants, we simply wanted to give individuals the ability to vote for their overall favourite concept. This gave us an idea of which concept would be likely to benefit the community the most, and so be adopted for actual use by them.

This resulted in a more flushed out application prototype that we were extremely excited to get it into the hands of our users. Gaining feedback on this now more mature prototype came through a number of methods:

1:1 user testing - Members of the zu team had community members work with the application under one of our team's observation. This provides some the highest quality insight into the apps success in the presentation of features and functionality.

Dot Voting - As in our previous use of dot voting on interface sketches, we now made printouts of the application screens, taped them to the wall and encouraged community members to vote on their favourite features.

Feedback Notes - Feedback notes gather more specific insights, new ideas and enhancements — then just votes. And participants enjoy the ability to leave feedback and suggestions right next to interface features, and to see what other folks are saying. This is a high quality feedback method providing insights very useful to the designers.

Interviews - Members of our team and zu's were again standing ready to answer questions, and to engage in brief conversations to clarify exactly the nature of the participants opinion, idea or critique.

Getting feedback on our prototypes was in essence just more research. We gathered information about how people use the solution, where they stumble, what they liked, what they disliked, and things we can make better. Design Thinking has led us to a Smart Cities Solution that we can confidently say was designed and created by and for the community using it. This engagement with users is the missing step in so many software projects that fail. Our extensive efforts in community engagement on the app greatly increases our potential for success.

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Data & Privacy

PRELIMINARY PRIVACY IMPACT ASSESSMENT (PIA) OR PRELIMINARY RATIONALE ANALYSIS (PRA) WITH EVIDENCE THAT RELEVANT PRIVACY AUTHORITIES WERE CONSULTED AND THEIR GUIDANCE WAS CONSIDERED IN ITS DEVELOPMENT

Following an in-depth analysis of our Smart Cities Challenge solution(s), and multiple meetings with the Privacy Commissioners of Canada, Ontario, and Quebec, we are confident in taking the appropriate measures to ensure the minimization, anonymization, consensual and security in the collection, use and disclosure of information. To both implement and maintain an effective future-proofed solution, while constantly measuring our progress, a number of PII and non-PII data points will need to be collected. Within our PPIA, we highlighted ways in which we intend and commit to comply with the Personal Information Protection and Electronic Documents Act.

Types of methods of data collection, generation, analysis, storage and transmission, and plans for re-use, re-distribution, derivative production, archiving, and preservation that reflects the entire data lifecycle in project design.

As members of the communities ourselves, and proud of Akwesasne individualism, we approach the collection, generation, analysis, storage, and transmission of data as if it were our own.

Collected - Personal information will be collected within the application through. This data will be gathered anonymously from inception and in aggregated form to gain insight into the progress of the community. Collected information will include personal information, aggregated information, and device information.

Personal Information - Full name, Home address, Email address, Credit Card Numbers, Age Range, Telephone and Login Details. This information is fully encrypted at first point of contact, in transit and at rest.

Aggregated Information - Gender, Race, Age Range, Workplace, Height & Weight, BMI, Waist Circumference, Physical Activity Levels, Diet, Fruits and Vegetable Intake, Blood Pressure, Blood Sugar Levels, Family History in Relation to Diabetes

Device Information - Device IDs, Internet Protocol (IP) address, Unique Device Identifier, Cookies tracking, and Location Tracking (While using the app)

Adept in the security of information, our partners, zu, have been ensuring the safe

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disclosure of information for over 23 years. All data surfaced and in transit between the application and Mohawk Council of Akwesasne Servers, will be managed through;

- SSL encrypted communication for all data in transit.
- Credentialed access to sensitive information at all touch points.
- Strong, AES encryption of sensitive data at rest.
- Secure, off-site storage of data backups
- Logical, and physical separation of collected PII and de-identified, aggregate data that will power community dashboards and open data initiatives.
- An extract, transform, load (ETL) step to pull data from the community application database into a separate repository of information used to generate redistributable reports that are devoid of PI.

Use - The use of the collected information will ultimately allow us to measure the success of our Smart Cities Solution. It will provide us insight into the communities progress enabling us to adapt our approach in areas of low participation and capitalize on areas of high participation. All information will be fully encrypted through SSL, and in an aggregated form to not tie information to an individual or key identifier.

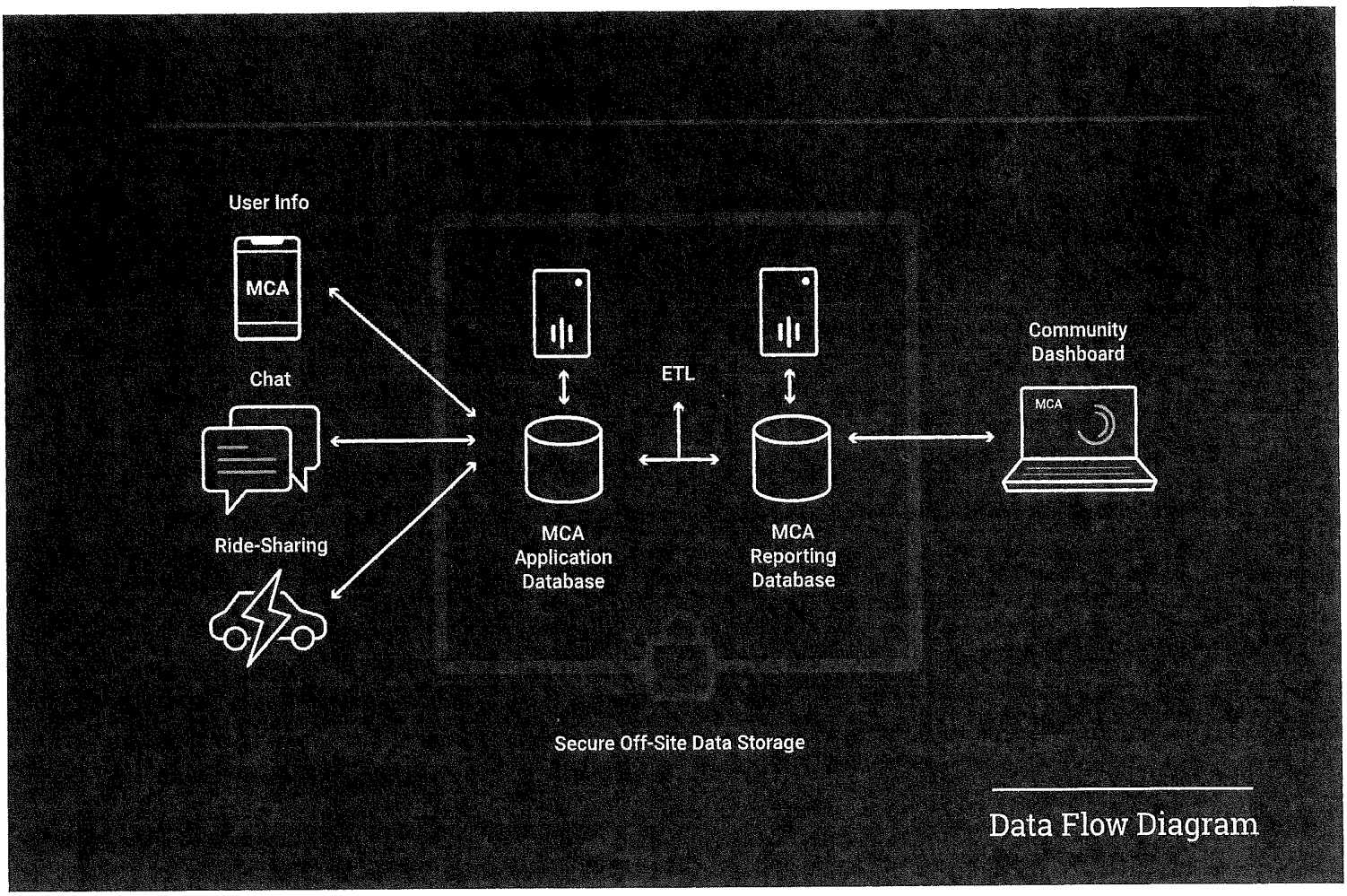
Disclosure - All information not highlighted as aggregate information, will be fully encrypted and untied to the individual at initial contact, in transit and at rest. Personal information will not be made available to any third parties but only Mohawk Council of Akwesasne internal trend analysis and measurement

Efforts made to integrate security and privacy considerations into project design, particularly those that were raised users, residents, and other stakeholders.

Balancing design standards, user experience, and the privacy implications resulting from the former are all considerations necessary for the implementation of our Community Application. Below we highlight several best practices to integrate security and privacy considerations into our project design.

- Identification of what personal information is being, or may be, collected about them at time of consent
- Identification of all purposes for which information is collected, used or disclosed at time of consent
- Provide information to individuals in manageable and easily-accessible ways
- Multi-Factor Authentication
- "Just-in-Time" privacy notice where possible
- Treating consent as a dynamic and interactive process.
- Be positioned to demonstrate - either in the case of a complaint from an individual or a proactive query from

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Data Flow Diagram

a privacy regulator - that we have a process in place to obtain consent from individuals.

- Obtain consent from a parent or guardian for any individual unable to provide meaningful consent themselves
- The ability of an individual's right to withdraw consent
- The ability of an individual's right to review and update personal information logged

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Budget & Project Breakdown

zu's projects are tracked hour by hour, day, by day, week by week and month by month. Their time tracking system called Replicon records their time in 15-minute increments. The time spent is fed into burn and resource charts that are scrutinized against detailed work plans produced at the beginning of each production phase and broken down further by each week by zu's experienced product owners. The PO's work with zu's designers and developers to further break down work on key features into bite-sized "user stories", that are then used to create tasks in Jira and Replicon for assigning work and recording time respectively.

The Akwesasne team is kept in the loop via zu's weekly progress reports that feature a cost breakdown to date, budget forecast for the week ahead and expected spend upon completion. Risks are flagged in the report and discussed in weekly production meeting with the Akwesasne team. A decision log is kept by zu to maintain transparency throughout the project. Between their time tracking system, weekly reports and weekly status meeting, we'll be kept informed of risks, spend totals and decisions to ensure proper cost control from kickoff to launch. Work is completed upon our approval with production billing rate of $140/hr and a standalone strategy rate of $175/hour.

Our Smart Cities Solution will be assembled using, really no experimental technologies or untested software approaches. Therefore, our estimates are straightforward and not based on speculative math. Nevertheless, public tenders under the oversight of the before mentioned committees should provide us with competitive prices for the equipment and installation of the equipment we need to build the Electric Public Transportation and Smart Greenhouse Systems.



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APPLICATION & DASHBOARD	HOURS	SUB-TOTAL
Phase 1: Strategy & Validation Stage	150	$175,875.00
Phase 2: Design	230	$273,000.00
Phase 3: Development	355	$509,250.00
Phase 4: Dashboard Development	240	$252,000.00
Subtotal	**975**	**$1,210,125.00**
With contingency 10%		$1,331,137.50
Taxes (11%)		$146,425.13
Travel Costs & Expenses		$75,000.00
Application & Dashboard Implementation Total		**$1,552,562.63**

GREENHOUSE IMPLEMENTATION ESTIMATE	SUB-TOTAL
Greenhouse Engineering and Design	$150,000.00
Ahkwesahsne Mohawk School Greenhouse	$300,000.00
Kana:takon School Greenhouse	$300,000.00
Tsi Snaihne School Community Outreach Greenhouse	$450,000.00
Curriculum Specialist (3-Year Term)	$240,000.00
Subtotal	**$1,440,000.00**
Taxes (11%)	$158,400.00
Greenhouse Implementation Total	**$1,598,400.00**

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ELECTRIC TRANSPORTATION SYSTEM ESTIMATE	SUB-TOTAL
Electric Cars (12 x $45,000 each)	$540,000.00
Electric Car Charging Stations (6 x $5,000 each)	$30,000.00
Natural Resources Canada Rebate	($15,000.00)
Electric Bus	$300,000.00
Subtotal	**$855,000.00**
Taxes (11%)	$94,050.00
Transport System Implementation Total	**$949,050.00**

OVERHEAD COSTS	
Project Coordinator Salary - 2 Year Term	$200,000.00
Project Assistant Salary (x1) - 2 Year Term	$150,000.00
Greenhouse Interns (x3)	$150,000.00
Driver Wages	$100,000.00
Subtotal	**$600,000.00**
Admin Management (10%)	$60,000.00
Taxes (11%)	**$72,600.00**
Overhead Total	**$732,600.00**

PROJECT COSTS	
Application & Dashboard Implementation Total	$1,552,562.63
Greenhouse Implementation Total	$1,598,400.00
Transport System Implementation Total	$949,050.00
Overhead Total	$732,600.00
Project Total	**$4,832,612.63**

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FINALIST GRANT EXPENDITURES	
zu Strategy & Design Consultation	$176,200.00
Community Engagement Events	$29,500.00
Project Coordinator Salary	$8,000.00
Travel	$7,000.00
Subtotal	**$220,700.00**
Taxes (11%)	$24,277.00
Expenditure Total	**$244,977.00**

** Remainder of budget will be used through the spring finalist stages, including presentation and travel*

Implementation Phase Requirements

While our Challenge couldn't be more significant to our community, the proposed Smart Cities system does not require special attention in regards to either municipal, provincial, or federal legislation, nor for reporting or policy requirements. Our consultation with Indigenous groups, since this is ourselves, is about ensuring we are inclusive of the many voices of our community. To that end, we have relied on many types of engagement to determine our initial approaches, and as touchpoints at every step of the planning and process of solution delivery. The most complex areas of legislative impact are around personal data privacy, and the risks of trying to build a comprehensive understanding of the state of our people's health. This is covered in our Preliminary Privacy Impact Assessment.

Community Employment Benefit

Our Smart Cities project will provide many benefits towards new skill development, as well as full and part time labour opportunities. Part of the value of these employment opportunities will be every participant knowing that the work they are involved in directly benefits our community and has the higher purpose

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of improving health outcomes and quality of life at Akwesasne. The Electric Public Transportation System will create employment through MCA employed Smart Taxi drivers, and bus drivers. The Greenhouse will create opportunities for all ages and ability levels, providing positions in horticulture engineering, gardening, plumbing and electrical, as well as project and inventory management. Volunteers will also be needed and will receive exposure to trades and professions not currently in Akwesasne. The Akwesasne Community Application will also create numerous opportunities. Our Mohawk Council of Akwesasne Information Services team will undoubtedly need more help, and will towards those graduating from Ontario Emerging Jobs Institute for applicants. Hosting, maintaining and enhancing a combined mobile and web-based application like the Akwesasne Community Application requires all manner of skills. These include programming for all the devices and frameworks in use, database management, server management, system security and privacy, CMS management, social feed integrations, location management, training, and more. Some areas will require a depth of expertise, others will be necessary at shallower depths of experience. We are committed to not only innovating the products and services of our community but also developing the expertise and education of our people. It is time for us to make use of the technology that is key to our moving forward with our challenges and opportunities, and to become self-sufficient with these skills.

Commitment to a Climate Lens Assessment

Should we have the opportunity to move forward with the implementation phase, we will commit to completing the Climate Lens Assessment. This will make more sense after the public tenders for solution equipment have been received, and choices made about which equipment provides the best value at that future point in time. We are confident our Smart Cities approach will bring positive climate impact, but will confirm the expected measured effects when appropriate details for the analysis are available.

Risk in Regards to Implementation Plans and the Regulatory Environment

We do not foresee risks to our Smart Cities project in failing to meet relevant municipal, provincial, and federal reporting and legislative requirements. Granted there are always risks associated with making mistakes in regards to construction of buildings, and the Smart Greenhouses are structures. There are information privacy risks. There are labour standards rules. Their are employment related taxes to be paid. There is general reporting to the various Revenue Collection agencies. But none of these seem either notable as unique to our project, nor are new risks that our community does not already face.

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Thank you for taking the time to read our proposal. We hope you have found our plans to improve the health of our people through this combination of Design Thinking, Smart Technologies and Web-based Software to be practical, achievable and worthy of being taken to fruition.

Our consultation with Indigenous groups, since this is ourselves, is about ensuring we are inclusive of the many voices of our community.

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Appendix A

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SCHEDULE "A" to MASTER SERVICE AGREEMENT
STATEMENT OF WORK: SUPPORT AND OPTIMIZATION

RE: Website Support and Optimization Service Agreement between the Mohawk Council of Akwesasne. (the "Client") and zu.com Communications Inc. (the "Webmaster") dated effective the 30th day of September 2018.

Support and Optimization Overview

Retaining long-term value from any digital asset requires a commitment to supporting the software development lifecycle. The increasingly rapid pace at which web technology and best practices, online threats and user expectations evolve make it hard to keep up. Our support and optimization model is designed to keep MCA team members aware of issues affecting site health and security, opportunities for iterative enhancement and potential opportunities to leverage new trends or technologies.

We structure our approach to long-term viability in two ways. The support fee enables your website to be flexible and protected from the changing nature of technology and online threats while the optimization budget allows your website to evolve alongside your corporate and communications strategies. Together, these two approaches to health and optimization ensure the successful transformation of your digital asset over time.

Definitions:

Bug – A bug is defined as a defect or defects in the existing code that produces an incorrect or unexpected result.
Existing code – Refers to code in use at the commencement of support and optimization agreement.
Minor version – Point sequence updates to supported, dependent software. Ex. major.*minor*
Major version – Whole number sequence updates to supported, dependent software. Ex. *major*.minor.

Schedule A: Budget

Annual Support Budget: Fixed TBD broken into a TBD monthly fee.
Monthly fee includes the services outlined in Schedule B: Support Services. The scope of services will be evaluated annually from the initial start date as the website may grow and the scope of support services and fees may be expanded.

Annual Optimization Budget: Recommended TBD broken into a TBD monthly forecast.
The annual optimization budget will include the variable costs dedicated to building out new features, website enhancements and major system upgrades discussed in Schedule C: Optimization Services. Optimization work will only be completed upon client approval at a production billing rate of $140/hr and a standalone strategy rate of $175/hour.

*Any changes in costs as a result of changes to hosting arrangements at the request of the client will be reflected in changes to the monthly fees.
*Variable cost will be affected based on US dollar conversion and hosting usage.

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* Any work related to hosting maintenance including server configuration, server maintenance and host provider management will be recorded hourly and billed to the optimization budget at a rate of $140/hr.

Schedule B: Support Services

Support Services Scope:

1. Monthly proactive performance testing and bug diagnosis
    a. New minor version and major version browser/OS testing and 3rd party integrations monitoring for updates or security issues.
    b. Run any automated tests as well as manual testing per code release.
    c. Generate bug report; prioritize non-urgent bugs; catalogue major version browser and OS issues for optimization.

2. Bug resolution
    a. Bugs will be catalogued and prioritized based on services levels outlined in Schedule D.
    b. Bugs will be fixed based on priority.
    c. Minor version browser/OS and 3rd party integrations bugs will be resolved under the fixed support fee outlined in Schedule A.
    d. Major version browser/OS and 3rd party integrations upgrades covered under optimization budget outlined in Schedule A.

3. 3rd party integrations support
    a. Any fixes required to ensure 3rd party integrations are up to date, secure and functioning.
    b. 3rd party integrations may include:
        i. Google Maps
        ii. YouTube
        iii. Google Analytics

4. Drupal Support
    a. Minor version updates and security patches
    b. Deployment support

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c. Administration View bug diagnosis and resolution

d. Additional local environment setup for ensured redundancy

5. Quarterly Services Reporting

a. Incident tracking and diagnosis

b. Analytics review

c. Document major risks

d. Document known 3rd party feed updates or enhanced feature availability

e. Document new browser/OS and device releases

6. Supported Browsers and Devices:

Monthly Testing - We currently test for the following operating systems and devices:

Device	Versions	OS
iPhone	SE, 8, 8+, X	iOS 11.0+
iPad	Mini, 4th Gen, Pro	iOS 11.0+
Android Phone & Tablet		Android 6.0+

Note: A review of website traffic by browser and OS will be conducted to determine whether backwards compatibility is required. If any one browser or OS makes up more than 10% of the overall traffic, zu will ensure the website is optimized for that instance.

Browser	Versions
Internet Explorer	11.0+

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Safari	Latest version
Firefox	Latest version
Google Chrome	Latest version

Schedule C: Optimization Services

While Support Services ensures asset health, Optimization maintains relevancy, strategic alignment and future growth opportunities. If assets are left stale they will never achieve the long-term value intended for the business or users. We recommend a balance between investing in system upgrades and feature enhancement to keep pace with the evolving nature of web technology and user expectations.

1. Website optimization:
    a. Custom feature development
    b. Section or website-wide content updates
    c. Major version Drupal upgrades (ie. 8.0 – 9.0)
    d. Additional 3rd party tool integration, API development, microservice integration
    e. Production design elements
        i. Infographics
        ii. Data visualization
        iii. Print materials
        iv. Heuristics reviews
    f. Website template adjustments
    g. Website main navigation changes
    h. Strategy services: user testing, stakeholder engagement, design sprints, product design, and development

2. Microsite development and optimization:

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a. Additional microservice websites for campaigns or special needs

b. Development of additional websites such as a dark site for crisis communications, community websites, further form integrations

Schedule D: Service Levels

zu business hours are 8:30 AM – 4:30 PM, Monday-Friday

Team - The developers responsible for performing support services include senior zu team members including one Acquia Drupal certified developer.

Urgent Requests:

1. Impact on all users on given platforms.
2. Website or application is non-functioning or severely degraded.
3. Loss of functionality to an entire section of the website.
4. Notice must be emailed to MCA@zu.com to ensure all members of the production team and support staff are notified.
5. zu will respond within one (1) hour with an estimated timeline to address such a request within business hours.
6. Urgent requests will be resolved at the earliest possible time and as quickly as possible. The team will work continuously until a resolution is met.
7. Urgent requests brought about by actions of the Mohawk Council of Akwesasne, its host provider or 3rd party participants will be resolved. Billing costs associated with these issues will be reviewed on a case by case basis and possibly fall outside the support services budget.
8. Should an urgent request be identified and communicated to zu outside of the stated business hours, and should the issue be deemed unable to be mitigated through a short-term rollback, zu Operations will then assess the next steps on a case-by-case basis in consultation with the Mohawk Council of Akwesasne to determine an appropriate resolution.

Non-urgent requests:

1. Impact on one (1) or more user groups or any device platform.
2. Application continues to work but non-critical functionality is unavailable. Restoration is not time sensitive.
3. Application continues to work but little non-critical functionality is unavailable.
4. Request is made in Zendesk or, if Zendesk is not being leveraged, a request is emailed directly to the Product Owner PO.

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5. Response within eight (8) hours on a timeline for an estimate within business hours.
6. Non-urgent requests will be prioritized and resolved based on a mutually agreeable schedule.
    a. This doesn't include downtime that might occur due to the host provider.

MCA Responsibilities:

1. Grant zu access to MCA's facilities, information technology infrastructure, information and data, and personnel for the provision of the services.;
2. Maintain backup data, and perform all other tasks required or recommended by zu to prevent or mitigate any loss or damage to MCA's data or other information arising out of the provision of the Services;
3. Comply with all reasonable procedures and requirement of zu to facilitate and assist in the provision of the Services
4. Perform those tasks assigned to MCA conscientiously and using qualifies and competent personnel;
5. Active communication with the zu team, and bi-weekly meeting attendance;
6. Drupal CMS content authoring & publishing, including;
    a. The editing of existing and addition of new content and documents
    b. Creation of new pages using existing content and page types
    c. Management of Content Menu Settings and URL Paths
    d. Rearrangement and addition of menu items

Schedule E: Quarterly Performance Reporting

Availability (Current Month; Previous Month; YTD):
- Service Time
- Unplanned Downtime Duration
- Maximum Downtime Duration
- Number of Downtime Occurrences
- Total Page Failures

User Experience (Current Month; Previous Month; YTD):
- Average Response Time
- Maximum Response Time

Capacity (Current Month; Previous Month; YTD):
- Average User Capacity
- Maximum User Capacity

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Completed Pages
Bandwidth Consumption

Performance (Current Month; Previous Month; YTD):

- Average CPU Usage
- Maximum CPU Usage
- Average Latency
- Total Page Hits
- Average Page Load Time
- Maximum Page Load Time

IN WITNESS WHEREOF the parties hereto have executed this Statement of Work to be effective as of the 1st day of January 2019 ending the 31st day of December 2019.

Mohawk Council of Akwesasne	zu.com Communications Inc.
Per: _____	Per:_____
Title: _____	Title:_____
Signature: _____	Signature: _____

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Appendix B

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Smart Cities Challenge Proposal



March 5, 2019
Akwesasne Submission

A257867

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AKWESASNE MOHAWK COUNCIL RESOLUTION

File Reference:

MCR #: 2018/2019 #346

THE	MOHAWK COUNCIL OF AKWESASNE	THIS MEETING TOOK PLACE IN THE TERRITORY OF AKWESASNE WITH THE FOLLOWING MEMBERS OF THE AKWESASNE MOHAWK COUNCIL PRESIDING
AGENCY	SOUTHERN ONTARIO DISTRICT	
PROVINCE	ONTARIO/QUEBEC	RECORDED VOTE
PLACE	Administration 1 Building	For: 9 — ☒ Carried
DATE	4 (Day) March (Month) 2019 (Year)	Against: 0 — ☐ Denied
		Abstention:

DO HEREBY RESOLVE:

Moved: Tim Thompson

Seconded: Theresa Jacobs

*WHEREAS, the Mohawks of Akwesasne have the existing and inherent right of **self-determination**, which includes the inherent jurisdiction over their lands, peoples and territory;*

*AND WHEREAS, the Mohawks of Akwesasne have the aboriginal and treaty rights, and other rights and freedoms that are recognized and affirmed in the Constitution of Canada, which include the inherent right of **self-determination** and jurisdiction over their lands, peoples and territory;*

*AND WHEREAS, the Mohawk Council of Akwesasne is the community government within the territory of Akwesasne and has inherent **jurisdiction** to make laws, regulations and policies to meet the needs and concerns of the Mohawks of Akwesasne;*

AND WHEREAS, the Mohawk Council of Akwesasne intends to preserve the cultural, political and economic integrity of the Mohawk territory and community of Akwesasne;

WHEREAS, Infrastructure Canada announced Canada's Smart Cities Challenge in the fall of 2017, which is a competition open to municipalities, local or regional government, and indigenous communities (First Nations, Inuit and Metis) across Canada; and

WHEREAS, the Mohawk Council of Akwesasne (MCA) staff, leadership and technicians discussed the Smart Cities Challenge and worked with a digital consultant on framing the Challenge Statement for submission; and

WHEREAS, Mohawk Council of Akwesasne submitted the finalized challenge statement was selected as a finalist for the Infrastructure Canada Smart Cities Challenge; and

WHEREAS, The Smart Akwesasne Team worked diligently on collecting community input and formulated the criteria for the compilation of the final proposal submission; and

WHEREAS, The final proposal is now complete and has been prepared for submission;

THEREFORE BE IT RESOLVED THAT, The Mohawk Council of Akwesasne approves the final proposal and supports it's submission to Infrastructure Canada for consideration in the Smart Cities Challenge.

CARRIED.

Grand Chief ☒ Yes ☐ No

Chief ☒ Yes ☐ No ☐ Ab | Chief ☒ Yes ☐ No ☐ Ab | Chief ☒ Yes ☐ No ☐ Ab

Chief ☒ Yes ☐ No ☐ Ab | Chief ☒ Yes ☐ No ☐ Ab | Chief ☐ Yes ☐ No ☐ Ab

Chief ☒ Yes ☐ No ☐ Ab | Chief ☒ Yes ☐ No ☐ Ab | Chief ☐ Yes ☐ No ☐ Ab

Chief ☒ Yes ☐ No ☐ Ab | Chief ☒ Yes ☐ No ☐ Ab | Chief ☐ Yes ☐ No ☐ Ab

Executive Summary

Our Smart Cities Challenge: To reduce the prevalence of new cases of diabetes at Akwesasne to the rate of the Canadian average. Our goal looks rather humble, to only be as bad off as the rest of the Canadian population. With this statement, however, the people of Akwesasne draw a line in the sand against the existential threat of diabetes. And our work maybe beneficial to others: Recent research reviewing 111 studies worldwide confirmed a disproportionate burden of diabetic disease complications among all Indigenous peoples regardless of their geographic location.

(From: Global complication rates of type 2 diabetes in Indigenous peoples: A comprehensive review)

We recognize that the situation Akwesasne folks now face was ultimately caused by our loss of traditional ways. A steamroller of westernization disrupted our traditional lifestyles, polluted our natural food sources, and dropped on top of the Akwesasne territory three complicating political jurisdictions, not of our making. Our skills and competencies in the old ways lost relevance. Our elders' ability to provide guidance using traditional teachings and ceremonies was derailed. The temptation of western consumptive habits and modern food, that is, frankly disease causing exacerbated our genetic susceptibility for diabetes, as did our now overly sedentary lifestyles. Our traditions sought to preserve our unique relationship with the environment, to make us a sustainable society. This has been replaced by our acceptance of living in a negatively altered state, and of accepting the need for modern medicine, which does not bring us back to health. It does not cure but keeps us in a state of perpetual decreased vitality.

But how to reverse this trend towards ever worsening health? How can we address this problem in a new way?

We became aware of how organizations and industries were re-inventing themselves and disrupting their existing situation for the better through the use of Design Thinking. With our partners, we learned how to get to the root of our problem, and how to come up with ideas to solve the problem.

We wanted to have all of our community involved. We wanted to make our work transparent so our residents' relationships with our public organizations and with each other would be stronger. We wanted our people involved so the solutions that are

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designed will work for our people because they were part of developing where we are going at every step.

We started by looking over everything we had previously studied. We brought together our people singly, in groups, and remotely through surveys and phone calls. We discussed and identified problems. We thought of over 100 causes and solutions and then arrived at key insights regarding our predicament. We determined that the precursors leading to high levels of diabetes are related to these rather straightforward factors:

- Food Accessibility
- Network Accessibility
- Transportation Accessibility
- Westernization
- Checkup Frequency in Health and Dental
- Healthcare System Disconnection
- Loss of target demographic following primary school.

(These will be explained in detail later in our proposal).

We learned that the way forward for the health of Akwesasne must be a multipronged approach, working on many battle fronts at the same time. In our own traditions of health we remember from a Haudenosaunee perspective Goodmindedness, Peacefulness, and Strength are synonymous with a unified mind, body, and spirit concept. Similarly, our ability to achieve a healthy state will focus on four pillars that summarize our insights: Wellness, Tradition, Access, and Measurement. These Pillars will become themes for our actions in our Smart Cities approach, and take the form of new tools, and a new way of communicating, remembering and teaching. With the help of technology, the way forward is for us to accurately understand our own condition, organize ourselves for change and then make change happen in measurable, adjustable ways.

In the big picture we are where we are because we could not adapt when westernization and industrial technology changed our environment. This is the same story for Indigenous people the world over and is also a story of misused power. While it is regrettable our current environment offers us much less in many ways then it once did, it also has new things in it. Our elders could walk into the bush and point to dozens of things that had nutritional, medicinal or cultural uses. Now our environment has technologies and machines that we need to recognize as useful and use. And not just use, but develop our own skills in their use.

In the years since we were forced to abandon traditional ways and lost our self-sufficiency, the spirit of our community was also damaged. The disruption to Kanikonhriio or Goodmindedness, and Sken:nen or Peacefulness, led to the loss of our strength in looking after ourselves and each other. It weakened our self-worth, our contribution of shared effort, our access to teachings; all were made difficult. Even food in our own territory can no longer be

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drawn from the river or grown safely.

Yet the strength of our community can be reinvigorated, especially if we tackle the issue of diabetes. We can make use of new technologies such as mobile communication to help us function like a community again. Systems can be introduced that will make us strong together by keeping us in touch, by responding to each others requests for help or to learn; we can share our learnings and join one another in healthy activities, and get to know one another.

Our health challenges are made harder because we don't know one another. Not in the causal sense of knowing but in the sense that our health services don't have proper information on our individual health. The fracturing of our community across jurisdictions and health districts means we can hardly even know ourselves in the sense of having an accurate medical history, often spread across provinces and countries. So how can we understand the health status of our community or plan to improve it? A mobile application, designed for the purposes of organizing us and our information can give us back this glue that can make us a community again. Modern tools can make our problems understandable, and allow us to find insights into our condition so we can develop ways to reverse our maladaptation to this still relatively newly imposed environment.

Now, in thinking about how technology can help Akwesasne, and what the Smart Cities challenge may permit us to accomplish, we started with a new way of thinking as a group. Design Thinking helps organizations innovate, which is really just a word for adapting. And this approach allowed us make up time for those years when we weren't adapting; we wanted to move ahead but had trouble deciding what needed to be done. Now we have gone over what we know, focussed on a challenge, engaged our community, developed some momentum and made a plan that uses smart technologies as an antidote for the issues caused by previous modernization.

Akwesasne has recognized the Smart Cities Challenge as an opportunity to face our hardest challenge. It has brought our community together and we have found a way to organize ourselves to move forward. While much of the world's technology had caused problems for us in the past, we will now use technology as a raw material to regain our vitality.

Our plan for adoption of technology will be on our terms. Our project probably does not seem earth shattering, which is a rate of change we find disconcerting, anyway. Through the use of about a dozen electric vehicles, the construction of 3 greenhouses adopted by the school curriculum, and a mobile application we can put in everyone's hand we plan to attack the 4 pillars of our challenge. With this limited investment in machines and software we will address the insights about our predicament.

Key to organizing the strength of our community will be the mobile and administrative coordination tool we are calling the Akwesasne Community

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Application. This brings everything together by providing communication amongst our people, coordination of services, access to food and community programs, measurement of service efficiency, and tracking of individual health. With these tools and oversight, we will make progress on our challenge, and reduce the rate of new disease to the rate of other Canadians. It would be nice to target the rate of diabetes in our people of 200 years ago, but for now it will be a major goal to achieve the health of other Canadians.

Our success will represent a watershed in our history. This will be where we began to defeat the most significant health risk for our people. This is where we began to improve the most significant factor for achieving a happy life, that being good health. Our elders knew how to make the most of what the environment offered; we can use that approach again. Tech is like a new herb, we must understand and use it. We will put it to use without obliterating the traditions that are our identity. We will use it while maintaining harmony with the environment.

We can use new things like e-cars and e-buses to get where it is important to go, without adding to the toxic load by burning oil. We can use greenhouses to replace our polluted food sources and gain back a measure of self-sufficiency. Mobile and computer programming can bring back the sharing and helping on which our strength as a nation was based. Digital tools will give us access to our collective memory and to the wisdom of our traditions, from which we regain pride necessary for our progress as a people. Our traditional teachings shows how strength is based on things working together. We will use that approach to work on many things at once to reverse the main threat to our health.

We believe this solution is extensible. Our package of ideas, with its mobile technology, databases, integration of health devices, location sensing, health diagnostics, statistics, transportation logistics, electric vehicles — these are all details to be adjusted for each case. At the center, however, will be the open-source system that is the hub of the services, and this is a non-proprietary system suitable for hosting anywhere. What we have learned, the approaches we take, the way we integrate the very new with the old will surely be helpful to aboriginal nations across Canada and the world over.

We are not the only people whose nation has been knocked out of harmony with the environment because of colonialism. We are not the only aboriginals whose communities were disfigured by imposed change and 'progress'. Regardless of cause, other indigenous people around the world are vulnerable to developing diabetes at the rates we are. They would surely benefit from our experience with this project. They would be welcome to our technology.

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Vision

The goal of our Akwesasne Smart Cities Challenge is to leverage smart technologies to reduce new cases of diabetes in Akwesasne to the Canadian national average. Six months ago our preliminary proposal laid out four pillars of focus, and we hold true to that vision in both our process and outcomes. These four pillars are improving approaches to community wellness, incorporation of holistic Indigenous practices, improved access to community services, and finally, tracking of health diagnostics for a measurable approach.

Community Wellness

The approach to our first pillar, community wellness, calls for making existing opportunities more accessible, increasing the number of people taking advantage of these initiatives, while simultaneously improving the existing systems supporting them. The Mohawk Council of Akwesasne, Community Health and numerous individuals in the community provide a number of opportunities for the improvement of physical, mental, spiritual and emotional wellness in their community. These programs include The Green Food Bag, a service offered by the Department of Health, which provides fresh fruit and vegetables to households at a low cost on a monthly basis; daily yoga, pilates and fitness classes at the recreational center, free cooking, knitting, art, and taekwondo classes. Also provided is an adventure club that takes groups of individuals outdoors to experience nature through hiking, bike rides, fishing, and other activities. These are just a few of the many programs and opportunities available to the people of Akwesasne. Unfortunately, participation rates are rather low with stagnant growth uptake. Many individuals are restricted to the programs in their own district or are unaware of when and where things are happening. Our proposed solution will address these impediments in a multi-faceted approach, through improved intrinsic motivators of awareness; ease of scheduling and community connection; by improving accessibility via more affordable transportation, and through measuring the effects of our efforts to further improve existing services.

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Adding to the lack of community wellness is the barriers to healthy food sources within the community, including long drives to grocery stores, and high levels of mercury in both the Saint Lawrence River and surrounding soil, stealing our traditional practices of gardening. To address the issue of food insecurity and inaccessibility, we will implement three Smart Greenhouses through a phased roll-out approach at each of the Akwesasne Mohawk Board of Education (AMBE) Schools locating one in each district. The intention of this project is to first create a curriculum based on agricultural education teaching years 6 through 13 on how to grow fruits and vegetables with the importance of a healthy diet. The second goal of this project is to help address the transportational barriers by using students as a vehicle to get healthier options onto young families tables. Lastly, gardening promotes physical health, mental health through stress relief, exercise, brain health, nutrition, and healing, which is not only a contributor to reducing pre-diabetes, [redacted]ut also following the teachings of our [redacted]ndigenous and Mohawk practices.

[redacted]Our Greenhouse implementation is planned [redacted]o be fully automated including temperature [redacted]control, the amount of light saturation, [redacted]umidity levels, soil moisture as well as [redacted]ther factors. Smart greenhouses can [redacted]e controlled remotely over the cloud [redacted]hrough an application, eliminating the [redacted]eed for a person to be present for most [redacted]perational needs. By using IoT, sensors [redacted]nd actuators, factors such as temperature [redacted]nd humidity can be monitored remotely, and changed based on needs to create the most viable growing environment for the products. Although fully automated, connecting children with the natural world and allowing them to explore the outdoors, including our school gardens, will be an integral part of our integrated curriculum. Students work in the garden, weeding, watering and tending to the beds. Classes utilize the space for lessons in science, social studies, math, reading, writing, and painting. A living laboratory, children are growing, experimenting, observing, measuring, comparing, and learning to care for something that is important to the Akwesasne Mohawk Board of Education and to sustainability efforts around the world. A garden is as much a story about the people who create it as it is about the garden itself. School Greenhouse Gardens are spaces for "hands-on" education, incorporating the full cycle of learning associated with healthy food - from growing to nutrition to cooking and eating. This will provide hands-on learning experience and a living classroom for Akwesasne.

Incorporation of Indigenous Community Practices

Many of the issues we face, and particularly the challenge we are experiencing with diabetes, can be attributed to the loss of the traditional ways of diet, activity levels and mindset. To tap into the strength of our traditions we will be integrating these cultural beliefs that served us well for centuries. These practices, even if put to use in combination with modern

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technologies, will once again help us regain our vitality.

Our intention to incorporate Indigenous Community Practices means we will approach health and wellbeing from more than just the modern clinical perspective. Akwesasne is part of the Haudenosaunee Confederacy and remains connected to our traditional roots. Holistic Indigenous practices encompass three principles that were introduced to our people as the Peacemaker traveled the land: Kankonhriio or Goodmindedness, Sken:nen or Peacefulness, and Kasastensera or Strength. This teaching became known as the Great Law of Peace. Essentially, what the Peacemaker taught throughout the territory was that the practice of Kanikonhriio or Goodmindedness would bring Peace or Skennenkowa to the people in the land. When the Peacefulness was pervasive through the territory, the people would gain a Strength or Kasastensera that could not be overcome by negative forces. From a Haudenosaunee perspective Goodmindedness, Peacefulness, and Strength are synonymous with the concept of mind, body, and spirit. This holistic approach to wellness has gained significant traction in alternative healing practices. The popularity of respecting the interrelationship of mind, body, and spirit is undoubtedly due to its effectiveness, especially in combination with modern medicine or as an alternate. In the Haudenosaunee Wellness Model, the 'health' of Haudenosaunee individuals, families, clans, communities, nations and overall confederacy can be measured using indicators strictly from our teachings and cultural mores. Likewise, an individual can receive guidance on a process to return to a state of 'health' using our traditional teachings and ceremonies.

The Haudenosaunee Environmental Task Force has proceeded with a project to develop an environmental protection process based on their Indigenous world view and relationship with the natural world. Such a process enables individual nations and communities of the Haudenosaunee to protect and restore the natural world, while helping to preserve their unique relationship with it, as a sustainable society. The process devised criteria and indicators for health of the natural world including people, which has a foundation in Haudenosaunee culture and traditions.

Through our Smart Cities Challenge proposal we keep these teachings and values at the center of all solutions, smart or otherwise. The Akwesasne Community Application will embrace holistic Indigenous practices through the teachings it contains the insights it provides to users, and the accessibility of these resources. The application will simply provide the means for the people of Akwesasne to achieve and maintain Good Mindedness, Peacefulness and Strength.

Improved Access to Community Services

The geographical footprint of Akwesasne is unique and includes jurisdictions in Ontario, Quebec and the state of New York. For many citizens, significant distances, travel

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times and border delays both ways impact accessibility to major services. This limits our access to facilities and infrastructure where physical health, fitness activities and training are provided as well as accessibility to fresh, healthy food.

Without personal vehicles, getting between major public hubs or to a grocery store, fitness and recreation centers, or healthcare providers is unfortunately challenging, and a real impediment to these trips occurring. Right now Akwesasne relies solely on taxi-cab. These companies — based out of surrounding cities Cornwall, Ontario and Massena, New York — charge high rates to travel into the districts of Cornwall Island, St. Regis, and St. Snye. Additional charges accrue due to the extremely sparsely populated community and additional drive time to come into the reservation. Our plan in overcoming this challenge is to bring affordable and accessible public transportation to the community of Akwesasne. To do this we will organize a Mohawk Council of Akwesasne (MCA) subsidized taxi-cab service, as well as designing and beta testing a project for on-demand electric public transit bus services. Through these two transportation initiative we will facilitate the important movement of our citizens between our districts and to needed services including fitness and recreation centers, healthcare providers in various locations and to purchase food at grocery stores. Through a phased roll-out approach we will begin by purchasing an electric vehicle per district in order to gain feedback on the program and truly understand our capacity requirements.

Based on the preliminary research this will lead to four cars per district, a total of twelve cars as allotted in our budget.

Tracking of Health Diagnostics for a Measurable Approach

The prevalence of Diabetes in First Nation communities is disturbing. Diabetes Canada states the rate of diabetes for First Nations individuals living on a reserve is 3-5 times higher than other Canadians. The Canadian national average is 9%. The rate in Akwesasne is 33%. While we plan to include many measurements in the Smart Cities system — to help us understand and influence patterns of behaviour, optimize services and logistics, to provide feedback to help in the iteration of ideas — one measure is preeminent in our challenge: the number of new cases of diabetes in Akwesasne. This one number must be reduced to that of the Canadian national average. This is the goal which all the other pillars and tactics will be organized to achieve.

Consistent with research on diabetes in First Nations populations, the Akwesasne rate is more than three times the Canadian average. Through the aggregated data received from the Akwesasne application, CANRisk surveys completed within the application, individuals referred to the diabetes prevention and management team as well as the number of new cases of diabetes in Akwesasne, we can measure the relation between our efforts and the Smart Cities Challenge initiatives with a real change of diabetes in Akwesasne.

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(CANRisk surveys provide questions that help individuals determine if they are at higher risk of having pre-diabetes or type 2 diabetes.)

Apart from the measuring of health outcomes and diagnostics indicative of medical issues, our work with the Mohawk Council of Akwesasne Executive team also narrowed in on Key Performance Indicators that would indicate if our solution was having a positive effect on the factors contributing to health outcomes; for example, were our chosen tactics shown in the behaviors of the community? Were our solutions achieving key objectives? The Akwesasne Community Application and digital ecosystem through which transportation and participation rates can be collected and analyzed is central to the measurement and understanding of these contributing KPI's.

To address this pillar, and the key performance indicators contributing to your Challenge statement we will collect and aggregate all of the data gathered from the application including CANRisk survey results, usage rates of programs and services, and progress of health metrics in aggregated form and display it in a dashboard view for the Mohawk Council of Akwesasne. This will allow us to understand both baseline data within our community and understand how our efforts are relating to decreasing the new cases of diabetes.

With these four pillars — Wellness, Tradition, Access, and Measurement — at the center of our Smart Cities Challenge, we will improve community wellness by developing better services while creating more affordable access to them. We will incorporate Indigenous Mohawk culture to tap the wisdom held in our traditional teachings and approach all issues with a more holistic mindset respectful of nature. All the while measuring movement towards targets, to show proven results or highlighting a need to adapt to better serve our people.

Reflective of the true needs of the community; as demonstrated through a compelling body of data and evidence and extensive resident engagement. Ambitious, achievable, and meaningful for the community and it's residents.

A human centered-design approach is based on delivering solutions that meet the true needs of the community, that are meaningful, that are aligned through initial and ongoing engagement with the end users. Consequently, our Smart Cities team has kept Community Engagement at the forefront of our Smart Cities Challenge solution. Over the past seven months, we have implemented the Design Thinking methodology in its many forms, facilitating workshops with important user groups, surveying and interviewing internal and external stakeholders. And, as this information provided direction and formed into ideas, prototypes and application interfaces, we gained feedback from Akwesasne community members on our solutions and how they should iterate via rounds of user testing. Our partners,

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zu, knows from experience that it is best to "measure twice and cut once" in designing solutions, which means keep users in the loop until things are completed, or one is likely to complete the wrong thing.

Using the Design Thinking process our outcomes and approach ensures the true needs of the community are served. Community members are the ones who both identified the problems and helped ideate the solutions. They were and are conferred with every step of the way providing feedback on solutions, voting on the best implementation strategies, and user testing our prototypes. In the past consultants sought to implement their own "expert" ideas in prescriptive ways; in Design Thinking, however, users are encouraged to critique things and provide their ideas on what would be a better implementation for the community.

In addressing the question of whether our identified challenge is meaningful to the community, we put forward this data point. During our community engagement events, we surveyed all individuals in attendance and found that 82% of respondents had either suffered from Diabetes themselves or had a family member who did.

Ambitious, achievable and meaningful for the community and its residents

When we look at our Smart Cities Challenge Solution, we believe our challenge statement defines ambition. Despite advancements in medical treatments and technology, diabetes remains a prevalent chronic disease that afflicts a huge number of Canadians and more specifically, Indigenous people. We recognize that reversing the prevalence of diabetes in Akwesasne requires a strong desire, determination, and hard work. This will mean, first, work to be done by the community and the vendor partners in determining what tools will come into existence, followed by commitment by our community members in engaging in the new systems and supporting these new approaches to health, fitness, and traditional mindsets. It is an ambitious undertaking to address a problem affecting so many individuals in the community, across Canada and around the world. We are excited and driven by the opportunity to create a healthier Akwesasne, as well as creating an approach that is intended to be extensible and actually extended to a much wider population.

Although our challenge is ambitious and potentially far-reaching, we have taken a very practical, grassroots approach to solving it. In looking at the many software project debacles over the past years, we observe the common problem that these systems were designed by experts for the many — but failed for the individual users — and so failed for the many, too. We started with individuals as we believe if our approach can be confirmed to work for one it has a much greater chance of working for the many.

The community is telling us our solution, the one they have helped us to develop is

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achievable. While there are more science-fiction oriented tech in existence, our choices, though less appealing, are based on proven technologies with the basic goal of providing our people with better access to the essentials of life.

- Smart Greenhouses Agriculture solutions account for 6% of all IoT projects, giving us confidence in a successful implementation with capable partners in order to cut operating costs and make the most of the available arable land in Akwesasne.
- The use of electric vehicles (EV) continues to grow with nearly 50,000 plug-in vehicles in Canada and the growth of 68% in 2017. Our Smart Cities Challenge will implement this proven technology as an economic and environmentally sustainable approach, which also meets the practical challenges of transportation for people, and the delivery of quality food and services.
- Design Thinking is reshaping service delivery and product design in industries from tech to banking and everything in between. Business consultancies are buying up Design Thinking shops as they have recognized the importance of Design Thinking to organizational strategy and success. We have chosen to use this approach to identify opportunities and problems and to produce solutions always in touch with our citizen users.
- In partnering with zu we are tapping both their expertise in Design Thinking, but also in their high success rate of creating digital products that centralize an array of components and capabilities. We will create an integrated technological solution that combines mobile applications with an administrative back-end while integrating third-party services and information feeds from other systems associated with services, greenhouse inventories, event scheduling and so forth. Our solution requires us to bring services, educational components, scheduling, information collection, and other capabilities together through a hyper-localized web-application to achieve success through a holistic system of seamlessly flowing parts. The Akwesasne Community Application will be used as an education tool, management software, expediter of services, and a collector of information.

Well-suited to a smart cities approach

Being a Smart City can mean many things. It can look very different depending on where you are and what is your pre-eminent challenge or opportunity. But the objective is always the same – using technology to create a sustainable future and improve the quality of life for people. As we come closer the end of our finalist phase, we are confident our solution takes on both this Smart City approach to technology, but also its approach to openness, integration, transferability, and collaboration.

Openness derives from our commitment to

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building this project with the community, and not for the community. Unlike many technology projects, we are not using a team of experts working in secret to produce something without their input, which our citizens will then be trained to use. Openness is embodied in what this is for and how it will work. Openness is also driving our planned collection and sharing of data and results, which are used to motivate improvement at an individual and group level, so progress can be celebrated as we move towards improved health. And openness also requires transparently communicating data collecting, use and disclosure with our users, always respecting privacy best practices.

Integration is embodied in the development of tools that fit into the lifestyles and activities of community members, rather than requiring our folks change to fit the system. Integration is represented in the interaction and interdependence of the capabilities we plan to develop in the Akwesasne Community Application. Each capacity — education, transportation, access to services and better food — enables or relies on the next, supporting our recognition of the interplay of curasitive and curative elements associated with our challenge. This dependence of factors is supported by our traditions, where mind, body, and spirit are supportive of a combined single strength. Our traditional teachings tell us there is a wholistic state of balance where maximum strength is attained. Our people can receive guidance on a process to return to a state of 'health' using our traditional teachings and ceremonies. In this case, technology will help us organize and integrate an additional combination of knowledge, tools, accessibility, transportation, measurement, feedback, health services and nutrition. All facets will be integrated in a virtuous circle to achieve more than the sum of the parts.

From the beginning, the approach has been about engaging our community, being open to ideas and feedback, and relying on even the most basic direction of identifying: What do we want this to be about? We believe that a human-centered design and co-design approach consistently produces a collaborative solution for the people and by the people. When one looks at our Smart Cities Challenge integration is a pivotal piece of it, we bring together Healthcare, Education, Public Transportation, Community Initiatives including recreation Integration is a large piece of our project, bringing together many essential services from nutrition, healthcare, education, executive council, public transportation services, data management, traditional practices, and more into one silo and system to provide seamless and high quality service to the community of Akwesasne. This is what integration means to our Smart Cities Proposal, it means bringing people, business and essential community services together to make them more accessible and affordable through collaboration.

Our strategy to solve the challenge that addresses root causes; it targets opportunities for improvement that also exist for many Indigenous communities the world over. As success is realized our



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approach should be shared. Our system ideas and components can be reused, whether as open-source software or as open-source ideas, all non-proprietary. The technologies will be able to be redeployed in other jurisdictions, incorporating modifications for changes in detail relating to specific communities, health measures, locations, educational elements, transportation challenges, targeted medical conditions and so forth.

National survey data has consistently shown that the national age-adjusted prevalence of diabetes is 3 to 5 times higher in First Nations than in the general population. Diabetes within Indigenous communities The higher rate of adverse health outcomes in Aboriginal peoples is associated with a number of factors, including lifestyle (diet and physical activity), genetic susceptibility, and historic political and psychosocial factors, stemming from a history of colonization that severely undermined Aboriginal values, culture, and spiritual practices. Barriers to care that are unique to Aboriginal settings also exacerbate the problem with fragmented healthcare, poor chronic disease management, high healthcare staff turnover, and limited or non-existent surveillance. In addition, social determinants of health, including low income, lack of education, high unemployment, poor living conditions, lack of social support, negative stereotyping and stigmatization, and poor access to health services compound the problem. This is common across Indigenous communities, and we believe the barrier facing the community of Akwesasne is common across all Indigenous communities big and small throughout Canada. We believe our Smart Cities approach, built with open source tools, solving problems people across Canada are facing makes transferability opportunities endless.

The Mohawk Council of Akwesasne and our digital consultancy zu have come together to build something greater than the sum of its parts. We at MCA bring a wealth of knowledge to the table about the barriers our people face, but also about the capabilities we have, and the strength of our teachings rooted in our culture. zu brings an ability to plan and deploy digital strategy, to build digital tools, and a proven knack for driving digital transformation at municipal, provincial, and federal levels. In combination, we bring an incredible amount of insight and opportunity identification to the Akwesasne Smart Cities Challenge. Our partnership to date has resulted in highly satisfying progress. Because this will be an ongoing battle against the challenge of diabetes and for the pillars of health, and given that technology is a rapidly adapting toolset, we expect this collaboration will span more than the timeline of this Challenge. Together, and with other partners, Akwesasne will foster a sustainable future for our people. And if we are successful, we will seek to share our learnings to improve the quality of life of other aboriginal communities, and others, across Canada and beyond.

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Performance Measurement

Using the tools and approaches developed by our solution will enable us to coordinate and collaborate on the necessary changes we need to reverse this plague of diabetes. We bring our sense of community and friendly competition to the table to challenge one another to be our best. The Smart Cities technology we have prototyped will tie in actual results on the behaviours we seek to modify, showing us where to go to next, and transparently reveal whether we are elevating ourselves into a new era of health, or further deteriorating. Our traditional ways will give this new technological approach the heart that it needs in order for it to be relevant to us. The outcome is admittedly ambitious, but it is achievable and so important to achieve.

The outcomes of the success of the implementation of our Smart Cities proposal are measurable first in the principle goal figure of reducing new cases of diabetes, and secondly, in the lifestyle measures that reduce the risk of diabetes. All measures are available to be measured by our application through unlinked aggregation. These specific measures include.

- The capacity of public transportation
- An individual's distance to programs and services
- Citizen awareness of available programs and services
- Number of people attending public programs and services or using videos within the app.
- Number of people completing in-app challenges or Competitions
- CANRisk surveys completed in-person, and through the Akwesasne Community Application.

Avoidance of diabetes going forward would indicate a major overall improvement in health and well-being for this community, and provide a way forward for other communities that adopt the protocol we will model.

In combining the new digital tools and medical knowledge the modern world provides with our traditional approaches that protected our health and environment in the past, our community will build a modern foundation of health to move forward, as with health, all things are possible.

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Project timelines, deliverables, and milestones that are ambitious yet attainable

Our project timeline spans a total of 24 months with notable milestones throughout that frame. Implementation of the application, dashboard, greenhouses and electric transportation system will all fall under this 2-year approach. Broken into a 4 phases, like many software projects, the creation of our application and dashboard will entail the strategy and validation of our findings to date as well as design and development. Working in tandem, the implementation phase of the Greenhouses and Transportation System will be completed with the same time constraints due to feature reliance on application qualities.

- SEE TIMELINE ON PAGE 20
- SEE MILESTONES ON PAGES 22 – 24

Our planned health and wellness initiatives contained in our solution are intended to reduce the prevalence of new cases of diabetes. Measurement is critical to monitoring the impact of these initiatives on stemming new cases of diabetes. In a workshop format organized by our consultants at zu, our Directors of the Mohawk Council of Akwesasne identified key performance indicators believed to capture the essence of our planned approaches. Working collaboratively, we developed 3 core metrics to measure the effectiveness of our initiatives health and with each metric, we ask 5 critical questions. Our 3 core metric categories are Access, Participation, and Screenings. Our 5 critical questions regarding each KPI are: Why does it matter? What affects it? What can we control? What are the measurables? What are the targets?

Key Performance Indicator #1: Accessibility

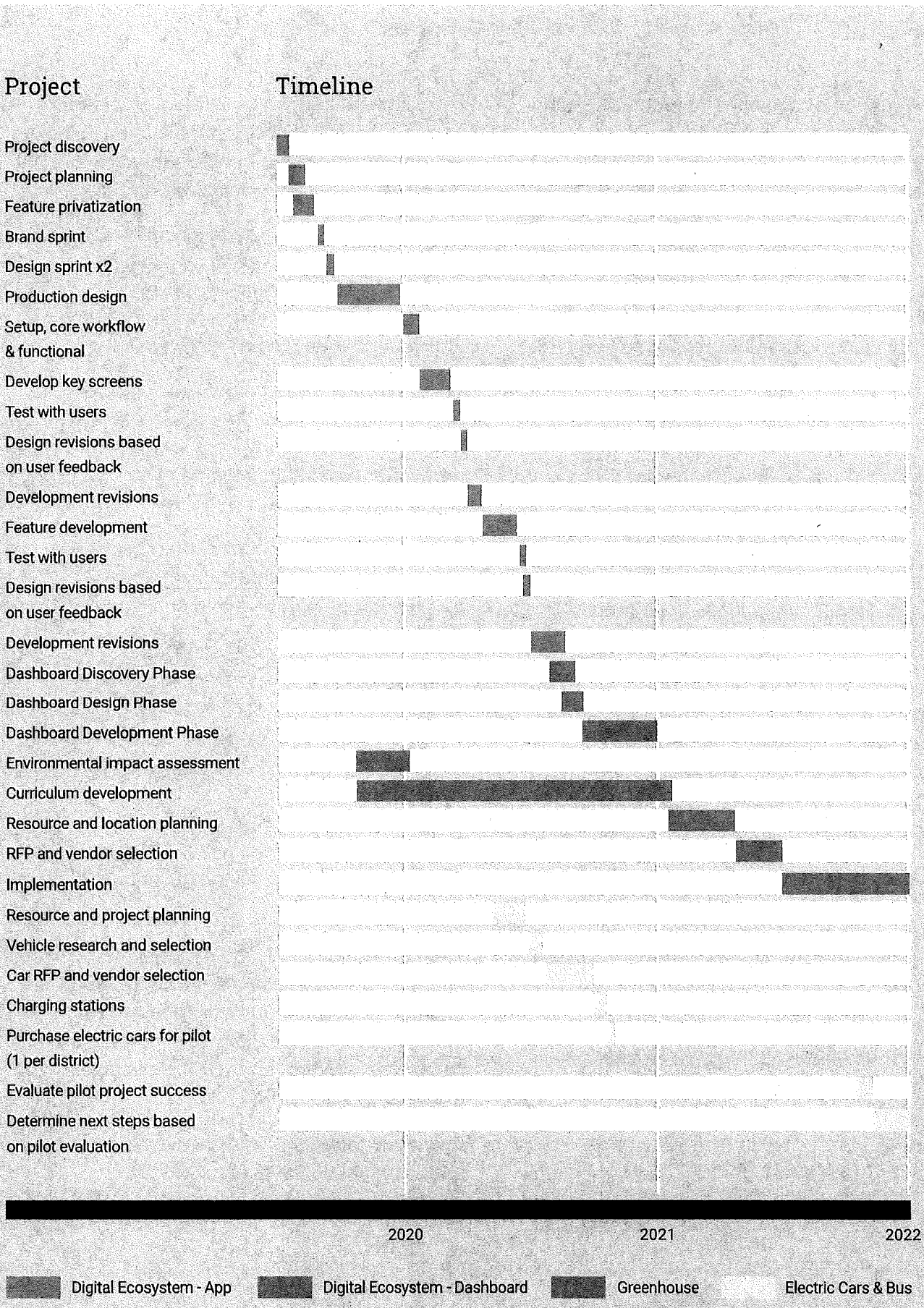
The Access KPI is defined as a measure of accessibility by community members to public health and wellness programs. For example, individuals seeking opportunities for active living, seeking health care, or at-risk individuals meeting medical program requirements. Measurable factors include the capacity of public transportation, an individual's distance to programs and services, and citizen awareness of available programs and services.

Why does Access matter? Transportation, location and awareness of opportunities all impact the community's and at-risk individuals' ability to live active lifestyles, obtain healthy food options and take advantage of any services not in their home location.

What affects Access? Home location, income, access to public transportation, access to an automobile, distance to the desired service, location of healthy food options.

What can we control about Access? Transportation options, scheduling, and coordination of transportation options, the

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Project
Timeline
Project discovery
Project planning
Feature privatization
Brand sprint
Design sprint x2
Production design
Setup, core workflow & functional
Develop key screens
Test with users
Design revisions based on user feedback
Development revisions
Feature development
Test with users
Design revisions based on user feedback
Development revisions
Dashboard Discovery Phase
Dashboard Design Phase
Dashboard Development Phase
Environmental impact assessment
Curriculum development
Resource and location planning
RFP and vendor selection
Implementation
Resource and project planning
Vehicle research and selection
Car RFP and vendor selection
Charging stations
Purchase electric cars for pilot (1 per district)
Evaluate pilot project success
Determine next steps based on pilot evaluation
2020
2021
2022
Digital Ecosystem - App
Digital Ecosystem - Dashboard
Greenhouse
Electric Cars & Bus

location of activities, location of healthy food options, delivery options.

Access Measurables - Program and services enrollment numbers, program and services communication engagement (social media engagement, application analytics, communication reach). Public transit capacity and utilization (seats available, usage). Greenhouse Food Box delivered/picked up.

Access Targets - Increase in program and services enrollment, increase in public awareness of Akwesasne programs and services, increase public transportation capacity, increase in public transportation usage, increase in the number of locations for healthy food options, increase in healthy food options used.

Key Performance Indicator #2: Participation

The Participation KPI is defined as the number of community members and at-risk individuals making use of public programs, services and completing app challenges. This includes the number of people attending public programs and services and the number of people completing in-app challenges.

Why does Participation matter? Participation levels indicate the uptake of these programs, services, and app challenge uptake, and are a precursor to them having positive effects. Tracking will inform future programming by indicating that oversubscribed programs should be scaled, and less popular ones should be re-examined. Initial participation levels for community activity will establish a baseline, so that modifications can be shown to improve or reduce participation levels.

What affects Participation levels? Location of opportunity, distance, accessibility, weather, quality of offering, ties to Akwesasne heritage, the motivation of the individual, awareness of opportunity.

What can we control about Participation levels? Access to transportation, the location of opportunity, cost, awareness, motivation, quality, association with Akwesasne heritage.

Participation Measurables - Number of attendees for programs and services, number of completed in-app challenges, feedback on the experience.

Participation Targets - Increase participation number for programs, services and app challenges. Increase participation numbers in targeted age groups: youth, family, and senior.

Key Performance Indicator #3: Screenings

The Screenings KPI is defined as the number of CANRisk surveys completed by undiagnosed community members. This includes both CANRisk surveys completed in-person, and through the Akwesasne Community Application.

Why does Screening matter? Early intervention in diabetes risk factors can prevent long-term illness; broader

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Application & Dashboard

MILESTONES	ZU	DELIVERABLE
Phase 1: Validation Stage	• Project Discovery • Project Kickoff & Planning • Feature Prioritization • Technical Discovery	• Presentation on approach and plan.
Phase 2: Design	• Brand Sprint • Finalization of Branding • Production Design • Task & Work Flow Design • Development Consultation	• Summary Report and Style Guide from Brand Sprint • Design Strategy Report • Sitemap diagram outlining project architecture.
Phase 3: Application Development	• Development Setup • Core Workflow & Functionality Development • Development of Key Screens • Feature Development	• Application page templates • Application building completed • Testing, Quality Assurance, and Revisions Completed
Phase 4: Dashboard Development	• Development Setup • Core Workflow & Functionality Development • Data Collection and Parsing • Chart Styling	• Dashboard building completed • Integration with application completed • Testing, Quality Assurance, and Revisions Completed

Smart Greenhouse Implementation

MILESTONES	MCA TASKS	DELIVERABLE
Phase 1: Project Planning	• Environmental Impact Assessment • Resource and Location Planning	• Environmental Impact Assessment Document
Phase 2: Curriculum Development	• Hiring of Specialist • Collaboration with AMBE	• Curriculum Implementation Plan & Rollout .
Phase 3: Request for Proposal and Vendor Selection	• RFP Development, Analysis, and Selection	• Selection of successful vendor.
Phase 4: Implementation	• Overseeing and management of vendor implementation • Integration with application	• Greenhouse Implementation Completed

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Electric Public Transportation System

MILESTONES	MCA TASKS	DELIVERABLE
Phase 1: Project Planning	• Resource and Project Planning • Vehicle research and selection	• Environmental Impact Assessment Document
Phase 2: Request for Proposal and Vendor Selection	• RFP Development, Analysis, and Selection	• Selection of successful vendor
Phase 3: Pilot Implementation	• Purchasing and Implementation of 1 Electric Car / District. • Integration with application • Evaluation of pilot project success	• Determine next steps based on pilot evaluation

community CANRisk screening results establish a baseline from which our challenge can measure its overall effectiveness; a CANRisk baseline allows comparison of community rates to national standards; a CANRisk baseline provides a clear picture of those at-risk in Akwesasne.

What affects Screening participation rates? Education about diabetes and health risks; awareness of what the survey results mean; public perception, access to survey.

What can we control about Screening participation rates? Increase the availability of survey; increase education and awareness of what individuals should do given the results of their survey; facilitating streaming of at-risk individuals to clinics for preparation of personal plans for diabetes prevention.

Screening Measurables - Number of CANRisk surveys completed; the number of individuals recommended to health professionals.

Screening Targets - Increase in the number of CANRisk survey completions; increase streaming of at-risk individuals to clinics for personal prevention plans.

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Payment Schedules

WEBSYSTEM PAYMENT SCHEDULE	DATE	AMOUNT
Phase 1: Validation Stage	July 1, 2019	$212,212.50 + tax
Phase 2: Design	September 1, 2019	$319,050.00 + tax
Phase 3: Application Development	January 1, 2020	$578,925.00 + tax
Phase 4: Dashboard Development	July 1, 2020	$295,950.00 + tax

SMART GREENHOUSE PAYMENT SCHEDULE	DATE	AMOUNT
Phase 1: Greenhouse Engineering, Resource Planning and Design & Curriculum Development	July 1, 2019	$590,000.00 + tax
Phase 2: Tsi Snaihne School Community Outreach Greenhouse Implementation	April 1st, 2021	$500,000.00 + tax
Phase 3: Kana:takon School Greenhouse Implementation	July 1, 2020	$350,000.00 + tax
Phase 4: Ahkwesahsne Mohawk School Greenhouse Implementation	October 1st, 2021	$350,000.00 + tax

ELECTRIC PUBLIC TRANSPORTATION PAYMENT SCHEDULE	DATE	AMOUNT
Phase 1: Project, Resource & Location Planning	June 1, 2019	$150,000.00 + tax
Phase 2: Piloting and Evaluation of Smart Taxi and Electric Bus Implementation	November 1, 2020	$535,000.00 + tax
Phase 3: Extended Implementation	October 1st, 2021	$480,000.00 + tax

** Project Coordinator and Project Assistant Coordinator are allocated throughout the Smart Greenhouse Payment and Electric Public Transportation Schedules.*

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Project Management

HUMAN RESOURCES

The Smart Cities project will provide many benefits towards new skill development, as well as full and part time labour opportunities. Part of the value of these employment opportunities will be knowing that the work directly benefits our community and has the higher purpose of improving health outcomes and quality of life at Akwesasne. There are many specific roles to fill, which we are confident we can recruit — or train and recruit — from our own community.

- For overall project oversight, A Project Manager position and an Assistant Project Manager will be secured to oversee the components of the Akwesasne Smart Cities project.
- To prepare the team for the Smart Greenhouse System, Economic Development will organize and familiate an agritech course so that the community will have a trained workforce from which to choose the actual employee team for the greenhouse implementations.
- Electric Public Transportation System drivers for the three small electrical vehicle programs — the Smart Taxi Service, the Smart Health & Social Programs Delivery, and Food Delivery Services (all for people), as well as drivers for them — will be secured through a job opportunities program drawing from our local employment resources. This will provide our programs with a pool of applicants from which we can select the best team members.
- To facilitate our community member end-users' use of the new technology, we will recruit Akwesasne high school students who will be put to work through a Best Matches program within our community centers in order to offer assistance to the elderly and other technology challenged community members. Here the young will mentor those who would like to learn how to better utilize their smartphones so as to make full use of the Akwesasne Community Application System, and all its various capabilities.
- In addition, our Mohawk Council of Akwesasne Information Services technical team will be trained by our technology partners (zu) to support the technical requirements of the Community Application System Administrative functionality, which is to be housed within our territory. This is

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the back-end to the mobile Akwesasne Community Application System and is responsible for organizing and supplying the mobile app with much of the information it presents. The training will ensure the Akwesasne Information Services technical team can maintain and administer the system, publish to it, update the app with information, news, educational elements, food inventories, maintain interactions with third party payment systems, make use of the information it aggregates, and so forth.

- **Electric Public Transportation System under-use may impact its viability**

  As the planned Electric Public Transportation System — consisting of the Smart Taxi Service, the Smart Health & Social Programs Delivery, the Smart Delivery Service and Electric Bus Services — is planned to collect minimal fees, there is a risk to the financial viability if there is underutilization of the capacity. This could creates an unsupportable cost burden. While there is a possibility that the smart taxi service may not be utilized, this risk seems rather small given the enthusiastic reactions noted at the community engagements. All have been strongly supported with "Can't wait!" attitudes toward a local taxi service at affordable rates.

  - Mitigating the case of low ridership for the electric vehicles, a fall back deployment is that the bus will still be utilized for the planned weekly runs our college students make to the Iohahiio facility.

    - Mitigating the case the case that the smart taxi and delivery services are not utilized, these vehicles will be re-allocated for use with the health and social programs.

- **Greenhouses in particular locations are underutilized**

  The activities associated with management of the greenhouses in the Smart Greenhouse System will be incorporated into the Akwesasne student curriculum. A greenhouse will be located at the Akwesasne Mohawk School with the purpose of learning and food production. If this greenhouse is not used to minimum required levels the AMS School's greenhouse there is a risk to the viability of the greenhouse system.

  - Mitigating the case of underutilization of the AMS school greenhouse container, that unit will be moved to closer to the Environments Offices and utilized within the agriculture sector for food production. Alternately, it can be relocated to the Iohahiio Education facility and be utilized for future adult courses on Innovative Growing Techniques.

  - This risk is highly un-anticipated as all greenhouses will be worked into the curriculum of the school.

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Procurement, including alignment with technology and partnership requirements

MOHAWK COUNCIL OF AKWESASNE PROCUREMENT STRATEGY

Our procurement strategy prescribes that when making purchases our council reaches out to at least three vendors through an RFP Process. For this purpose a purchase team is formed generally involving a finance department representative, a project manager and a manager representing the department impacted by the proposed purchase. This team then oversees the RFP process and reviews the incoming responses.

The Purchase of the Electric Bus for the Electric Public Transportation System will be administered through the Mohawk Council's Department of Community and Social Services along with the Board of Education's Transportation Supervisor. This person is key to the team as all further bus maintenance and bus scheduling decisions will be the responsibility of the transportation supervisor's position.

The intention of the Smart Taxi Service, the Smart Health & Social Programs Delivery, and the Smart Delivery Service is to create increased access of our social clients to have the means to obtain healthier foods, as well as to transport community members to medical appointments. ("Social clients" are individuals getting assistance from Community and Social Services.) These vehicle purchases and services, as well as the Smart Taxi Service Pilot Project will be organized through a team consisting of the Smart Akwesasne Team and the Social and Health Departments.

The Smart Greenhouses system purchases will be reviewed by a team comprised of the Akwesasne Mohawk Board of Education, and representatives from the Department of Tehotienawakon Economic Development program.

And, the most important precursors to desired change may not be what we are originally focusing on so our analysis of impact and influence should be somewhat adaptable.

Stakeholders, including analysis of impact and influence

ANALYZING IMPACT OF PROGRAMS

For each of our Smart Cities project initiative categories, we will put in place oversight teams best representing stakeholders of the area we wish to affect. These stakeholder teams will assist in the identification of success and performance factors, as well as contribute to the ongoing adaptation of measurements to best represent goals and progress attainment. Too many measurements, for instance, will likely be distracting from the most important factors. And, the most important precursors to desired change may not be what we are originally focusing on so our analysis of impact and influence should be somewhat adaptable.

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AKWESASNE COMMUNITY APPLICATION SYSTEM

A key stakeholder — especially in relation to the central challenge regarding the prevalence of new cases of diabetes — is the Mohawk Council of Akwesasne Health Department. This department will be instrumental in delineating the types of data most important to measure to both be effective in affecting the health precursors associated with our Smart cities Challenge, but also for tweaking our approaches to increase the program's effectiveness over the longer run. Targets of change may shift focus with the maturity of our program. For instance, initial goals may be about engagement and usage rates, which later give way to focus on improving service delivery and costs, which give way to focus on renewal and expansion of educational components, cultural curriculums and even recipes. So measurement must be flexible to take into account learnings and overall maturation of the program.

A stakeholder in all data collection, especially that flowing though the Community Application and Community Application Administrative system, is the Akwesasne Information Services technical team. This team is key to the always necessary step of information aggregation, organization and preparation for analysis by the more specific department stakeholder. The Technical Team will be included for both their technical support and technical knowledge. They will help clarify other team members understanding of the information, and so positively influence decision outcomes.

The Mohawk Council of Akwesasne Health Department will be primary users of the statistics and interpretation of data directly affecting health measurements and behaviours affecting health outcomes. For instance, screening numbers, service engagement and usage numbers, activity levels, food distribution measures, attendance to health services, missed appointments and so forth.

The Mohawk Council of Akwesasne Social Services Department will be keenly interested in the performance of the Electric Public Transportation System. These statistics are key to success factors in their area of responsibility. Central is the measure of (ideally) increasing transportation usage, which when higher is strongly suspected to better the quality of the lives of the social clients.

Our Smart Akwesasne Team and the Mohawk Council of Akwesasne Health Department will be eager for statistics the

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system produces regarding healthy food delivery, number of users obtaining rides to grocery stores and medical destinations, and increases in trip numbers for personal health care evaluations or screenings. Devising methods to capture behaviours of their individual clients in accessing and making use of transportation to increase wellness is tricky. Defining the base case is also challenging as the base case for the new situation does not currently exist. Therefore, much of the initial information will be used to establish a base case from which these departments will try to build performance.

The Akwesasne Mohawk Board of Education, Department of Tehotienawakon, including the Economic Development and Environment Program will all be paying close attention to the performance of the Smart Greenhouse system. This has an educational component and associated measures of success, as students are both involved in staffing a greenhouse, but also in engaging in learning their operation, and so graduating from the course. Economic Development is seeking to create economic value from the Smart Greenhouses, in the way of jobs, job skill development, food production and food cost savings. Economic Development will also be following the measures around the development of job skills and expansion of roles in technical areas to do with the Akwesasne Community Application and Administrative Web System, as there are many associated skills to do with populating the system with information, writing, video production for traditional cultural teaching dissemination, mentoring new users of mobile tech, system programming and maintenance, social tool use and many additional skills associated with maintaining the vitality Internet based systems. Economic Development may also monitor the economic impacts of new services from both a cost and revenue outlook, as well as on the value of keeping money associated with transportation in the community, rather than that money flowing to external transportation options. The Environment Division will be able to calculate the savings in CO2 production enabled by the switch of thousands of travel miles to electric from gas powered vehicles.

Communications strategies for community involvement, training, and feedback

Following the Design Thinking processes that have gotten us this far, we are eager to continue regular community engagements through quick surveys to gain feedback and ideas, so that we can continue to improve the system. With the core of the system based on the Akwesasne Community Application, which is a mobile hub in each community member's pocket, we have an immediate tool through which we can share information, news, questions, and new capabilities.

This is highly advantageous to the rapid evolution of our services. We can both listen directly to feedback and observe behaviour. Through questionnaires, polls,

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message boards and so forth, and we can observe behaviour, measure usage stats and so gain objective data. This may be an important balance as requests for feedback are likely to be weighted towards the opinions of more active or prolific online personalities in the community, with the new users less comfortable with writing essays on their new smartphone.

Additionally, because the Akwesasne Community Application is Internet-based, additional functionality to do with surveying, for example, is only a click away. There is no value to creating our own functionality in most cases, such as for polling — that is already available for free or very low cost online. We will simply use our in app capabilities to post updates that link to surveys, or to video resources, third party educational elements and so forth.

We expect that to best increase engagement with the new Smart City tools of our diverse end users, especially with social clients, that this may best be undertaken in a combination session of in-person instruction with also the online system in hand. Education sessions and review sessions are likely to occur in this way for clients involved in the services of specific departments, to learn how this department's services are now offered via the app. For example, our social clients can be introduced to Smart Taxi, Electric Bus pickup request, and so forth —when they are meeting with case managers. Groups feeling a need for the extra nudge of in-person training can also attend organized evening community engagement sessions, where everyone brings their phone and learns about a newly released function.

Monitoring, controlling and reporting strategies and checkpoints for contingencies and course corrections, if necessary

Following the Design Thinking approach, we will use the app to gather reviews on components, experiences with the services, ideas for improvement, and suggestions on how to make things more efficient. While Design Thinking helps with direction, zu uses the Agile Method for digital product delivery. The idea with Agile is that via frequent meetings with the client, (the Akwesasne Smart Team) progress on the functionality is reviewed and tweaked very regularly, as the application moves from minimum viable product to fully featured one. This emphasizes actual experience with the tool over documentation, and is proven as the best way to deliver software products. The whole approach is about course correction, about feedback from users.

This also provides a built in approach to managing scope while optimizing end result. We've used Design Thinking to collaborate with our community to get a very strong idea of what we need; BUT, until it is in the user's hands, and they are standing and waiting for pick-up from an Electric Bus, we can expect unforeseen problems to crop up, or cool new ideas for enhancement to emerge. It may be that, at this early stage of testing, that a scheduling

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idea for the Electric Bus is decided to be more important than some already planned feature of the Smart Greenhouse ordering, and since the greenhouse will not reach full production for another year that programming resources will be used by diverting them to the bus scheduling enhancement. So the scope is rebalanced in collaborative agreement between us and zu. Our Project Manager and their Product Owner notes this change of resource use and we move promptly on with development, without the overhead of massive documentation and change orders. When you are inventing new things this is the way to be. (If we are ordering a new community centre and it already has a complete blueprint, then the more formal change order approach is necessary.)

In regards to the purchasing of electric vehicles and greenhouses, a more detailed process of estimates, associated charges and fees, delivery and set-up, even total cost of ownership will be adhered to. Traditional cost controls are more appropriate to capital purchases. Purchasing bespoke software must also fit timelines and deliver certain features, it's just that what's in the final product will be impacted by ideas, epiphanies, and feedback and should be encouraged. Like a cook tasting their cooking along the way.

That being said, zu is well practiced in building digital products and services, including monitoring burn rates and being totally transparent with their clients as their software development project progresses. With their total team recording to time sheets, tracking progress in Jira, tracking our requests in Zendesk, all bolstered by regular weekly meetings with our Project Manager, and not even including the ongoing email, messaging and phone calls between our PM and their PO, there is little room for things to go off the rails without being immediately noticed. More formal reports are generated with every meeting and supplied to Smart Coordinator for review and action when required.

Weekly reviews of zu's Replicon time tracking system, where tasks are assigned a budget aligned to the statement of work, provides our Product Owner with real-time visibility on project health, task churn and slow down caused by blockers or delays. This information is then documented in the weekly Project Status Report provided from zu to MCA and any necessary steps to remove blockers or flag risks are discussed in weekly production meetings with the us.

There is a sweet spot between rigid timelines and development targets, and the serendipity of discovering new methods or better functionality changed by user testing along the way. zu explains they are well practiced at respecting the organizational necessity of steady progress towards agreed upon projects with the idea that we are in fact inventing the future, and the path towards invention may have a few unexpected twists and turns. Through our Production Road Map, several stage gates are implemented as a monitoring and course corrections strategy. Stage Gates are a project management technique in which an initiative or project is divided into distinct stages or phases, separated by decision points. At each of these phases,

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we will revisit scope, timeline, and budget, making any appropriate adaptations where necessary.

Approach to sustaining projects beyond the lifecycle of the challenge, if appropriate

Our vendor partners will be resources to assist us in our plans to gain a maximum lifespan from our Smart Cities Project. While we intend to be self-sufficient in the longer-term continuation of the Smart Cities systems, we also recognize that there is a need to renew and adapt the system with more modern versions of itself. At the very least there will be ongoing maintenance and enhancement of systems, with which the original vendors are expert, and can assist us in becoming expert, as well. This necessity to keep working to improve the system is to both preserve the functionality of things as they will be at the end of the first phase, but also to adapt to new technologies of our modern environment, and to take advantage of the emerging technologies, as we are doing at this point in time.

The Akwesasne Community Application (Mobile and Administrative) will be supported and maintained by the Mohawk Council of Akwesasne Information Services Program. zu may be called upon for more ambitious functional additions from time to time, though this is not currently part of the scope of the plan.

Smart Greenhouses will be sustained in conjunction with the Akwesasne Mohawk Board of Education (AMBE) and the Department of Tehotienawakon Environment Program, for the Akwesasne Mohawk School (AMS) and Tsisnaihne schools. The AMBE, Tehotienawakon Economic Development Programs will jointly utilize and maintain the St. Regis Smart Greenhouse location as it will be used for the school and as a special needs work experience location. We anticipate that this location has the potential to provide economic contribution to sustain the special needs program.

The Electric Bus will be fully sustainable through the budget of the Social Services Department. The Electric Bus expenditure simply represents a redeployment of a portion of and existing budget already dedicated to assisting their clients with transportation.

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Technology

DETAILS ABOUT THE TECHNOLOGIES INCLUDING RELEVANT APPLICATIONS ELSEWHERE AND RESULTS OF TESTING AND/OR PILOTING IN THE FINALIST PHASE.

In looking at the iPhone as a breakthrough event, it wasn't so much about inventing any of the capabilities it provided as it was wrapping them into one package. Similarly, our Smart Cities Challenge project is about combining the capabilities we know will address our Challenge into an integrated mobile system.

Our Digital Ecosystem encompasses both the Akwesasne Community Application, as well as the infrastructure elements of our plan. Included are native mobile application and web application development, multiple greenhouse implementations, and Akwesasne's first ever public transportation system. Greenhouses and a Smart Taxi service may not be viewed as groundbreaking or emerging technology, but to the Akwesasne community, they most definitely are. Our solution reflects the true needs of the community and will create improved health outcomes, new ways to address our challenges, and opportunities to develop expertise with new technology all through coordinated improvements in infrastructure, information, and accessibility. Akwesasne services will be enhanced with the support and integration of our mobile and web applications, both in what community members receive and in the ability of our public service workers to deliver them. Below we break down the details of the technologies involved, including examining relevant applications used in other jurisdictions, a look at case studies our partner zu has successfully completed and some of the results of testing carried out in this finalist phase.

Mobile application development is the set of processes and procedures involved in writing software for small, wireless computing devices such as smartphones or tablets. Each day thousands of mobile apps are published to the Google Play and Apple App Stores. Some of these mobile apps are games, others are social networks, and many are e-commerce apps. All of these apps, if professionally built, follow a similar mobile app development process.

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Dating back to the early adoption of responsive web design in 2011/2012, our partners, zu, have accumulated extensive experience developing responsive mobile websites and native applications, including the use of front-end frameworks such as Bootstrap and Foundation, as well as custom implementations using CSS3, CSS Grid, and Flexbox. zu's team has developed native iOS applications targeting phones and tablets going back to 2009/10 and iOS version 4. This includes both line-of-business applications based on standard UIKit components, along with richer experiences involving animation and physics frameworks such as Box2D and SpriteKit. They have continued to build responsive and native mobile projects since the availability of these devices and their tech stack continues to evolve.

zu develops widely-used native Android applications targeting phones and tablets for high profile clients, with projects dating back to version 4.0 in 2012. They develop for the core Android framework as well as with Google's trusted third party community partner libraries such as RetroFit, OkHttp, and Glide. zu's team has mature knowledge surrounding automated testing strategies for Android including both unit testing and instrumented testing user workflow. This past winter, a zu designer was selected as one of only 20 people worldwide to participate in a prestigious Android design workshop hosted by the Android Development team at the Google offices in San Francisco.

zu employs various modes of automated software testing. zu says: "We frequently unit test our application code with language-specific test frameworks, as well as develop functional tests using tools such as Selenium, WebDriver, Nightwatch.js, and others. We load test our applications using open source tools such as Apache Bench, Siege, and various cloud-based tools."

zu as Digital Partners

zu is an ideal partner for Akwesasne's Smart Cities solution because they offer skills in determining right direction, they have capabilities to build digital products that are required for the vision and they will provide long-term stewardship for the digital systems they have built. They also provide Design Thinking expertise which zu uses to design non-digital process and components, which is a proven method for creating things that will be well received by end users, as they are so much a part of the process of their development.

Here is a sample of the types of major projects and transformational work zu has accomplished in the past 24 years of their existence.

MOBILE AND MOBILE/DESKTOP PLATFORMS

From the development of the TimmyMe iOS App for Tim Hortons' in 2008 on the iPhone, which made sense with the advent of geo-location services, through the years of Blackberry development and its fall from favour. Now into Android development, as well as mobile responsive (or simply 'responsive') design, zu moves into the latest technology. But they always program

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for the purpose, not just to use a new technology. Currently, zu uses strong skills in iOS, Android and responsive web design to produce and maintain products for a variety of clients. Some projects of note include:

MYSASK 411 PLATFORM

Rebuilding Mysask411 Mobile and Desktop systems from the core (Term: 2013- Present)

Directwest built a 100-year legacy on connecting Saskatchewan buyers and sellers. The phonebook they produced served as the principal source for customers seeking and connecting with local businesses. As times changed, Directwest modernized its business offerings with a suite of digital products and services intended to keep pace with global technological innovation. Along with traditional industries around the world, however, Mysask411's user experience came up against disruptive digital headwinds and competition. The web and mobile versions of the Mysask411 platform struggled to perform on modern devices and needed to be rebuilt. Speed and performance were major issues. The web version and mobile applications had to address both mounting technical debt and a dated user experience.

The Mysask411 platform needed a renewed user experience, informed by users and built to last and adapt. zu was brought onto the project in August of 2013, and has since completed dozens of projects of large and smaller scale to improve the functionality and effectiveness of the suite of services the Mysask411 offers. In addition, zu uses Design Thinking with both DirectWest senior management teams and product teams to identify opportunities for service expansion, which are collected in project backlogs. These are then evaluated and developed on a priority ranking. zu is firmly part of the DirectWest team serving as a digital strategist, developer and long term optimizer of the suite of applications.

HELP ME TELL MY STORY / HELP ME TALK ABOUT MATH

Education Assessment System and iOS application (Term: March 31st 2016 - March 31st, 2019)

The Help Me Tell My Story education platform is another major achievement as an iOS and web system development that also incorporates Indigenous culture. The combination of technologies is similar to what will be deployed for Akwesasne. It has many levels of administrative access and collects data while optimizing the mobile user experience for the end users, who are children.

The Help Me Tell My Story assessment, which takes place by the children interacting with amusing gamified tasks, uses a holistic approach to measure oral language development for Prekindergarten and Kindergarten children. The Help Me Talk About Math application similarly uses a holistic approach to assessment to evaluate grade one students' understanding of seven mathematical processes: communication, making connections, mental mathematics and estimation, problem-solving, reasoning,

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and visualization. Both collect data from the children, their caregivers, their teachers, and Elders in their community and provide immediate access to results for educators and caregivers through easy-to-use web-based tools. The overall purpose of these assessment is to help create a real and measurable change in oral language development and real and measurable change in the mathematical process development of children across Saskatchewan.

Both these systems are extensible for other curriculums and are being extended to have French language versions. The systems have also been made available to other jurisdictions — as is intended with the Akwesasne Community Application — and the general public via the Apple App Store, though without the administrative functionality. zu continues to be a transformative digital partner for the Government of Saskatchewan, Ministry of Education.

Other Notable zu Applications

Here is a brief list of other projects requiring mobile application/web application combinations, as will be required for the Akwesasne project.

TIM HORTONS

TimmyMe iOS Application

When it was first launched, TimmyMe quickly became the top downloaded free iPhone app in Canada and Tim Hortons took notice. With over two million users, the app featured GPS to direct folks to the nearest Tim's drive-thru and included a notepad for taking orders from your co-workers.

SASKATCHEWAN ROUGHRIDERS

iOS Application

zu's created various digital solutions for Saskatchewan's favorite CFL team. In partnership with SaskTel, they took the Roughriders mobile with iPhone and Android apps that deliver schedules, standings, player profiles and stats, news, Twitter integration, videos, live radio streaming, shopping in the RiderStore and more. Rider Nation responded with over 100K downloads in the first year and over 3M sessions, leading to a 52% increase in orders and a 40% increase in customers.

MACKENZIE ART GALLERY

iOS Application

Mackenzie wanted to be a gallery for the 21st century, so zu was brought in to devise ways to use mobile technology as a catalyst for generating discussion, driving foot traffic, and connecting people to art like never before. Now their app is as much a part of the gallery experience as the physical gallery, helping people discover and engage with new exhibits and the permanent collection.

VITERRA MOBILE

Application Android and iOS

Buying and selling of crops require accurate information, and farmers may need that data while literally standing in the middle of a field. Going beyond providing up-to-date commodity prices offered at terminals, zu also created a

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nitrogen calculator so that farmers could work out their fertilizer needs on the fly. Users can change criteria, toggle results and, ultimately, make informed decisions. Viterra, like the farmers, understood how technology helps people work efficiently and effectively. This responsive website and web app, drawing on Viterra back-end systems for data feeds, experienced 434% first-year growth, representing 25,000 total hrs spent in the app in 1st year with half of all users accessing the app daily, and one-third spending 1-3 mins per session. The zu team was delighted to help them engage with the global farming community.

Approach to future-proofing the technologies (i.e safeguards against vendor-generated proprietary constraints and obsolescence, a workforce that is able to implement and operate the technologies and systems going forward.

Ensuring high quality and extensive customizability, the Akwesasne Community Application will be built as a Native mobile-web application. Native apps are built for specific platforms (iPhone, Android) and are written in the languages the platform accepts (for example, Swift and Objective-C for iOS apps and Java or Kotlin for native Android apps). Native apps are fast and responsive, distributed in app stores, offer intuitive user input and output and don't require an internet connection. In addition, native code is non-proprietary, has an army of developers at our disposal, and is free to use.

Though this is not a frequent occurrence for zu, transition of projects to alternative service providers does happen, and zu is ready by design and choice of frameworks to not have proprietary blockers preventing other suppliers from being able to take over custodianship of the systems they've built. Recent examples of projects being transferred away from zu include the planned-from-the-start repatriation of the Drupal-based City of Saskatoon websystem; and the repatriation of the PotashCorp websystem — after nearly 20 years of internal zu management — to the new Nutrien management team. (In both these cases, the relationship continues with zu being invited to contribute to new initiatives). In all cases of project repatriation, a transition plan is developed in consultation with the client on how to best setup the environments necessary for maintaining system health long-term and to provide the client team with strategies to maintain and optimize the system.

System longevity

Achieving long-term value from any digital asset requires a commitment to supporting the software development lifecycle. The increasingly rapid pace at which mobile and web technology evolves, and best practices, online threats and user expectations change make it hard to keep up. zu's support and optimization model is designed to keep the Akwesasne team aware of issues affecting application health and security. They will also keep us on track regarding opportunities for iterative

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enhancements and to take advantage of new trends or technologies, as they do with their other long-term clients.

ZU SUPPORT AND ENHANCEMENT SERVICES INCLUDE:

Support: Emphasizing continual testing and proactive analysis of known security threats and asset risks.

Optimization: Focusing on keeping pace with modern devices, browsers and operating systems impacting the performance of the platform for users.

Continual support and optimization go hand-in-hand to ensure our digital assets' long-term viability is maintained. zu's technical expertise and development processes make future adaptations such as API development, continued system integrations and reengineering cost-effective and made with ease. Services include:

- Monthly browser, OS and device testing
- Host environment performance measurement
- Optimization backlog development
- Major risk assessment and resolution
- Quarterly reporting
- Continued system integration
- API creation
- Design heuristics review
- Digital brand alignment

zu understands that the development of web-based tools and mobile applications can leave companies feeling handcuffed in their ability to operate systems going forward. Prior to completion of the Services, Akwesasne and zu will put in place an agreement zu for the maintenance and support of the Akwesasne Community Application; the agreement in Appendix A.

TECH EXPERIENCE OPPORTUNITIES FOR AKWESASNE MOHAWK FIRST NATION

Looking further into the future, this proposed digital eco-system will introduce the Akwesasne community to opportunities to take part in new technology in their community, both for those with existing expertise and those who hope to develop skills.

The Mohawk Council of Akwesasne works closely with the Ontario Emerging Jobs Institute (OEJI). OEJI is a unique offering that provides instruction from industry leaders and hands-on training for jobs of the future. Students train for the growing demand for skilled workers in areas identified as high need including topics such as web development, digital marketing, social media marketing, artificial intelligence, graphic design and search engine optimization. Currently, of the 160 students attending this program, 11 are from the Akwesasne First Nation.

The Mohawk Council of Akwesasne also currently has 15 personnel as a part of their Information Services team. This includes;

- 1 Manager
- 1 Program Support Officers
- 4 Network Analysts
- 4 Hardware Technicians
- 3 Software Analysts and 2 Help Desk Technicians

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The team supports provides a range of IT services to all departments and programs within MCA including the Akwesasne Mohawk Board of Education. Information Services oversees the maintenance, repair, upgrade, etc. of more than 800 computers and 25 individual networks and one wide area network. The Software Analyst team supports 75 different specialized software, some of which are built programmed in house. We feel we have the technical and human capacity that is able to implement and operate the proposed technologies and systems going forward. There will be opportunities for zu to train our team to the extent we find appropriate, knowing that zu could remain as principal stewards of the systems, or as helpers, or could be completely replaced by the Akwesasne team, at our option.

How the technologies comply with relevant legislative and regulatory requirements

LEGISLATIVE REQUIREMENTS

In Canada, mobile applications are regulated under the Personal Information Protection and Electronic Documents Act (PIPEDA). The Act, enacted in 2000, governs how private organizations collect, use and disclose personal information. MCA and zu commit to comply with all applicable laws regarding the protection of personal information including PIPEDA. Please reference our Preliminary Privacy Impact Analysis for in depth analysis.

FLEXIBLE DEVELOPMENT STANDARDS

Our Smart Cities Solution currently presents limited interoperability between technologies such as existing community systems, services, and infrastructure. However, our partner zu is well-versed creating necessary interactions (such as have been necessary in their past projects with many types of interactions) and uses due diligence in all expected and potential integrations. A few instances of interoperability have been identified and will be explored in the next phase for development. These include:

- Requesting, Tracking and Paying for MCA's Smart Taxi service within the application
- Ordering, Delivering and Paying for Greenhouse produce, and the 'Green Food Box' within the application
- Integration and interoperability with third-party fitness and health tracking applications
- Future interoperability with Telus health.

[redacted]

RIDE HAILING SERVICES & SMART GREENHOUSE INTEROPERABILITY

When developing our public transportation system and integrating it with the application, there are three pieces of interoperability requiring third party software and frameworks. First off, like other ride hailing services, (ie. Uber, Lyft, Instacart), our app requires access to the CoreLocation framework. This allows individuals to both request rides and share location addresses with a driver

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through geolocation, and order groceries to their specific location. This framework provides classes and protocols to configure and schedule location delivery and send location events to the server. The CoreLocation framework also lets our application define geographic regions and monitor a device's movements as it crosses defined boundaries. Secondly, to display point-to-point directions on a map within the app, iOS developers use a Framework called MapKit. Registering the app as a routing app then makes directions available to the Maps app and all other mapping software on a user's device. Android routes and directions, however, are made possible by the Google Maps Android API. Thirdly, to use a cashless system that allows credit and debit transactions and so remove all risk of human-to-human cash transfers — we will interoperate with one of two leading companies in the mobile payment market, Braintree or Stripe. Both payment frameworks are used by current, emerging and established companies and follow both the Code of Conduct for the Credit and Debit Card Industry in Canada, as well as PIPEDA.

FITNESS AND HEALTH APPLICATION INTEROPERABILITY

With health and fitness applications extremely prevalent today, understanding the interoperability of default and leading health applications will maximize the advantages of integration with them. To ensure the Akwesasne data is stored and managed exclusively under MCA Information Services we investigated the leading brands in health and data tracking. We need to understand the complexities and privacy concerns of the applications we intend to use, such as Apple Health, Google Fit, and Samsung Health, as well as the wearables offered by Fitbit, Garmin, and Apple Watch. Google Fit was subsequently quickly dismissed due to the requirement that any app that reads Google Fit data must also store any collected health data with Google.

APPLE HEALTH

Apple Health provides operating system level storage for health/fitness data through a framework called HealthKit. Apple's intent is for 3rd party app developers to create apps that integrate with HealthKit to make "rich" fitness data available to both the Apple Health App and HealthKit. Any app can request permission to read/write a number of different types of health information based on a large list of "categories" provided by Apple. Once fitness information is stored in HealthKit, it's essentially available to any app that the user grants access to read from HealthKit. While the HealthKit framework appears somewhat complex, it's capable of surfacing any data recorded by the Health App, or any other "service" (tracker apps), both as granular data and aggregate statistic. This is all good news.

SAMSUNG HEALTH

Samsung smartphones come with the Samsung Health App (aka "S Health") pre-installed. The Samsung Health app is also freely available on the Google Play store for installation on non-Samsung devices. In many ways, Samsung Health is analogous

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to Google Fit, but with two key distinctions. Any application that wishes to read/write/share data with Samsung Health must be approved as an official Samsung partner application. Unlike Google Fit, no Samsung account is required to use Samsung Health, though Samsung promotes the creation and use of an account to sync/backup data to Samsung's cloud service, and to make data available across multiple devices.

In conclusion, the health app ecosystem for Android is, unfortunately, more fragmented than iOS. There is no analog to HealthKit (operating system level storage) for Android, and it's up to individual apps to be responsible for the storage and sharing of health data.

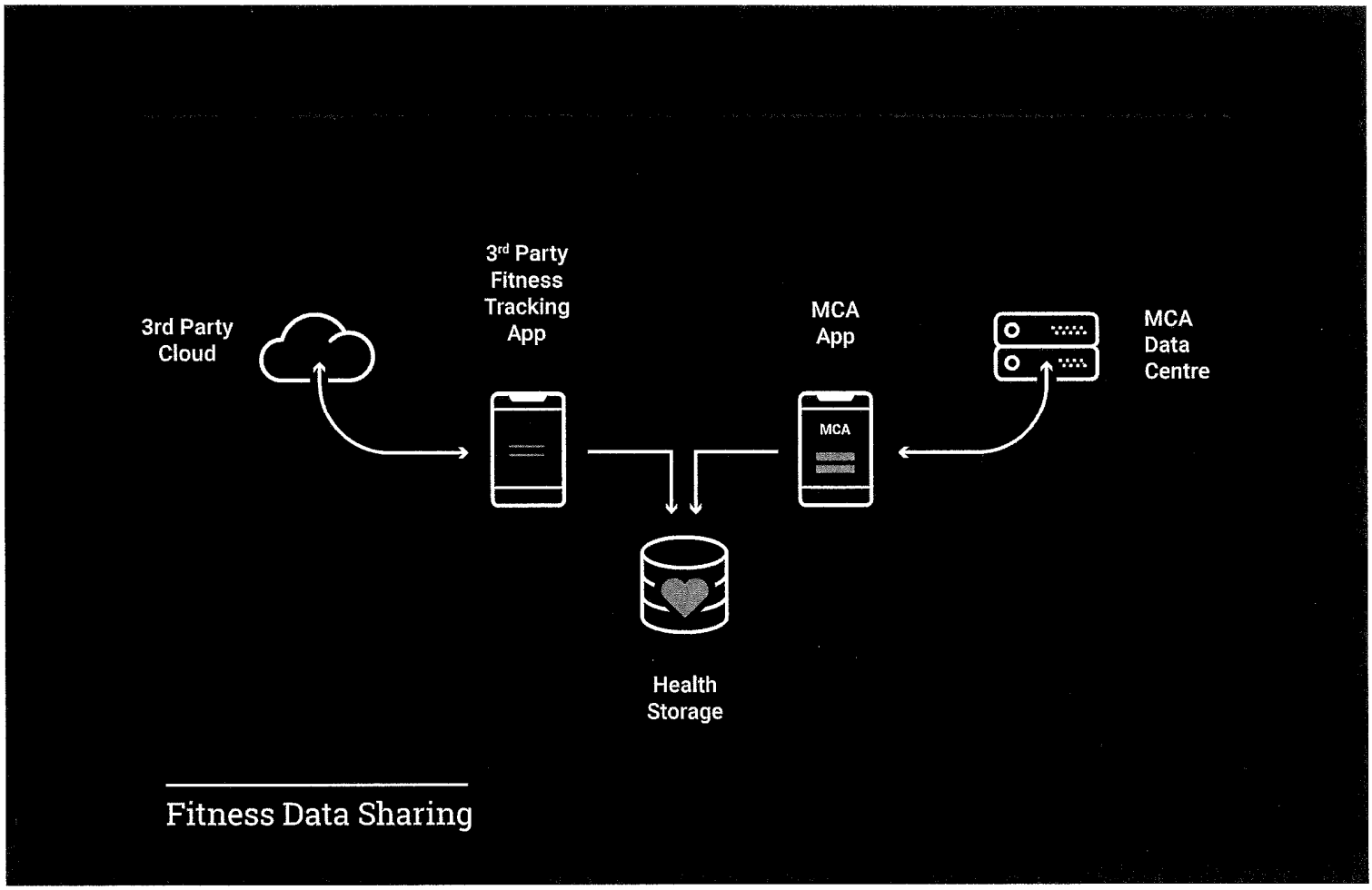
WEARABLES

- Fitbit does not directly integrate with Apple, Samsung, or Google health apps, though fitbit does allow access to data through a web-based API.
- Garmin provides a Garmin connect app for both platforms and so can sync data to any of the health apps discussed above.
- Apple Watch does not provide health tracking on its own. Rather, it relies on "WatchOS" extensions provided by applications installed on accompanying phones that can read and store biometrics to Apple Health.

With this background in mind, we plan to make use of Samsung Health (Android) and HealthKit (iOS) systems. We can then migrate the data users are currently tracking on their devices while maintaining a familiar user experience for individuals comfortable with their current applications. Privacy concerns remain at the forefront of our build; as stated, MCA and zu commit to complying with all applicable laws regarding the protection of personal information such as that found in The Personal Information Protection and Electronic Documents Act. Privacy is also key to earning the trust of users, as their engagement and acceptance is also a key measurable for our initiative's success.



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Fitness Data Sharing

TELUS HEALTH INTEROPERABILITY

The Mohawk Council of Akwesasne is in preliminary talks with Telus Health to implement their proprietary software throughout all Canadian jurisdictions. The opportunities and capabilities of this homegrown system is interesting but needs exploration. Further research and discovery will need to be completed during the strategy phase of implementation.

REPLICABILITY ACROSS CANADA

We suspect that the factors contributing to a higher prevalence of diabetes in the Akwesasne community hold true for all Indigenous communities across Canada.

If we succeed in having a real impact on health outcomes in Akwesasne through the areas of focus we have piloted, we will be open to having our approach and software replicated for use by other first nation communities. We are energized by the possibility of improving the health of other communities via our Smart Cities approach to targeting causative factors we suspect are consistent culprits. While the software may be directly applicable to other communities as it stands upon completion, some degree of customization will undoubtedly be necessary for its deployment, given the specifics of that second situation. Ideally, a consistent

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core could be maintained so those future improvements could be rolled out amongst all future users.

ROLES AND RESPONSIBILITIES OF TECHNOLOGY PARTNERS

The role of zu in this project includes helping our team collaboratively identify the strategic direction, providing the design for products and services including the development/programming and support of the Akwesasne Community Application, and it's integrated systems. Within our governance structure, prior to selection of both the Greenhouse System & Electric Public Transportation System technology partners a public tender will be requested for both personnel and strategic implementation.

IDENTIFICATION OF RISKS (E.G PRIVACY ISSUES, CYBERSECURITY BREACHES) AND DEVELOPMENT OF APPROPRIATE MITIGATION STRATEGIES

No Internet technology is risk-free. However, as we intend to program to best practice standards, and follow the available standards for privacy, system security, data back-up and so forth, we will reduce risk to the acceptable baseline all Internet-based systems face. At this time there are no known risks in the implementation of technology particular to this project.

ACCESSIBILITY AND USABILITY OF THE TECHNOLOGIES TO DIVERSE USERS, RESIDENTS AND OTHER STAKEHOLDERS THAT SUPPORT THEIR UPTAKE AND ACCEPTANCE.

Web Content Accessibility Guidelines (WCAG) 2.0 and Authoring Tool Accessibility Guidelines 2.0 covers a wide range of recommendations for making web content more accessible. Following these guidelines makes content accessible to a wider range of people with disabilities, including blindness and low vision, deafness and hearing loss, learning disabilities, cognitive limitations, limited movement, speech disabilities, photosensitivity and combinations of these. Following these guidelines will also often make your web content more usable in general. (http://www.w3.org/TR/WCAG20/)

Each page and feature will be developed with an understanding and incorporation of Web Content Accessibility. Some key elements of the guidelines include the 'Skip to Content' link which allows people to quickly access content by skipping primary and secondary navigation. A redeveloped application will also be screen reader enhanced optimizing the site for visibly impaired individuals. Appropriate contrast will need to be designed between links, text, images and any user interface elements on each page.

zu's team has relevant experience in developing websites and mobile platforms within these guidelines.. From these projects, zu has learned best practices that will be transferable to Directwest. Throughout development, zu will test the mobile platform to ensure that it is meeting level AA Web Content Accessibility. We will also be sure to use the Authoring Tool Accessibility Guidelines 2.0 for content created and migrated to MCA.

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Governance

GOVERNANCE FRAMEWORKS AND STRATEGIES TO OVERSEE AND MANAGE PROJECTS, PROJECT RISKS, FINDS, AND PARTNERS THAT ARE RIGOROUS, TRANSPARENT, EFFECTIVE, AND PROVIDE VALUE FOR MONEY

Since the late 90's MCA has been in a Nation Building process, a process that allows for the investigation and negotiation of a draft Akwesasne Governance Agreement. The process was initially termed a Nation Building process and has since been renamed Entewatathá:wi or "We Will Govern".

The overall goal of this process is to investigate the extent of Canada's commitment to negotiate a Self-Government Agreement specific to Akwesasne where MCA exercises jurisdiction. Entewatathá:wi has been working towards establishing the laws, regulations, policies, practices, and institutions that will govern the northern territory of Akwesasne. The Road to Self-Governance Negotiation of a final agreement on Governance will provide clear formal recognition by Canada of Akwesasne's governance institutions and address the relationship of Akwesasne's and Canada's laws. Negotiations have also begun with Ontario and Quebec on some jurisdictional issues. Self-Governance is a long and grueling process that involves negotiations with the government of Canada, our own local governments and leaders, educating and consulting our community and making sure we protect our inherent rights as Akwesasronon. Ultimately, it will be our community that determines whether or not to accept the negotiated Akwesasne Governance Agreement by holding a community referendum.

- Governance / Council Portfolio's include:
- Department of Technical Services
- Akwesasne Mohawk Board of Education
- Executive Services
- Department of Health
- Department of Housing
- Department of Justice
- Public Safety
- Department of Tehotiiennawakon
- Tehotiiennawakon - Environment Division

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Mohawk Council of Akwesasne Carries out projects with at least three personnel involved, Manager, Assistant, and Technician. Project timelines are created with project management theories. Regular project meetings are held with key personnel involved, this includes outside contractors. Mohawk Councils Finance policy requires 3 quotes for anything purchased over 1000.00.

- Managers can sign off up to 5000.00.
- Directors sign up to 50,000.00 with mandatory RFP process.
- The Executive Director signs up to 100,000.00.
- Any Contracts, payments over 100,000.00 must be processed by a Mohawk Council Resolution(MCR). There are 13 chiefs on council and 7 are required to sign in agreement of a decision through the MCR Process.

In working with clientele, their partners and unique stakeholder groups over the years, zu have some proven ideas on governance that can assist in our process as well. As a partnership we believe strongly in the benefit of open communication but recognize the need to focus the collaboration where possible. Before project kickoff, key client decision makers and approved deadlines will be revisited and finalized.

STRATEGY

Typically projects are built in phases with initial consulting and strategy leading to a deliverable such as a communications brief, information architecture, low-fidelity concept sketches or an experience prototype in the form of wireframes or a mobile prototype for user testing. During this phase, the client's Project Coordinator (PM or Manager) will help coordinate meetings, demonstrations and communicate feedback and approvals at our Product Owner, who is the main point of contact from kickoff to launch. The client's Project Champion (Director level) will be available to provide insight during consultations and liaise with executive and board members who require visibility. An Executive Sponsor (Executive Member) or Committee is often involved early on to set direction with our team but will be consulted throughout the phase to ensure objectives are being met.

PRODUCTION DESIGN AND DEVELOPMENT

Once the direction is set, active production begins with weekly demonstrations of progress as outlined in the project timeline. The Project Coordinator and Project Champion will be required to attend these meetings to provide input and liaise with executive and board members who require visibility. An Executive Sponsor or Executive Committee will be consulted throughout production to ensure objectives are being met at key milestones outlined in the project timeline.

Deliverables will be submitted to the client's Project Coordinator for internal feedback. Any approvals or sign off will follow in weekly production meetings creating a feedback loop from the start of production design and into development. Once development demonstrations begin,

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a Technical Lead (Client IT Group Member) will join the client's team to coordinate integrations, flag risks and provide materials and support to our developers if required.

Finally, active user acceptance testing will be performed within the feedback cycle and then again prior to launch. By the end of the project, end-to-end testing will be completed internally at zu and on the client side to reach final approval. Once the product is approved, the asset will go through predefined steps for launch as outlined in the project timeline.

ESCALATION

Throughout the entire process, from strategy to production and launch planning, any issues that require escalation beyond weekly project meetings will be addressed with the Account Manager by the client's manager/director representative. If unresolvable, issues will be escalated to the Executive Sponsor by the client's executive team member.

Details about the partners and their role, capacity and readiness

zu is our only major partner defined through the Smart Cities Challenge. They build digital products and services and uses a design strategy to drive innovation within organizations. Founded in Saskatoon in 1995, zu is a happy, motivated team of 35 confident in achieving success on every project and committed to working with clients building modern solutions for mature industry problems. zu's team is a mix of Design Thinking experts, analysts, production designers, developers, IT and client support specialists focused on building tools that are informed by users and meet client business objectives. Their services are grouped to correspond with the lifecycle of digital products.

Collectively zu has the bench strength and the decades of experience to hit home runs on big, challenging projects. Our technical depth and our cosmopolitan appreciation for style and elegance are focused by our adhesion to the user-centric approach to design. Our plans are therefore on target, our ability to execute proven and not easy to replicate, and the result for the MCA application and Smart Cities Challenge project will embody a balance between being uniquely engaging, practically sustainable and innovative. Our combination of youthful design, project sensibility and decades of programming experience, deployment and support means the best of all worlds for the Akwesasne web system, especially when it comes to creating something for today and for tomorrow.

RISK MANAGEMENT APPROACH

The goal of our risk management is to decrease the chance that we don't deliver working software to a happy client. We want our client to have participated in choices involving adding or chopping features and scope so that the most important features are accomplished on time and on budget.

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To assist with managing risk throughout projects, zu utilizes a Project Status Report. This document allows MCA and zu to communicate and provide weekly project status updates during client demos. We can highlight milestones, design concepts or major features and flag them if there is an issue, or if everything is on target. This will also highlight past accomplishments, key activities for the next week and upcoming issues that should be addressed early. We can track all decisions that impact the project, along with a budget update.

Communication is critical for project success. Our approach is to maximize project visibility with clients and form a tight-knit relationship with our project leader, the Product Owner. We document these plans in a project charter before kickoff. This document acts as a reference for key decision makers on the production side and the client side. It includes key milestones and project objectives. Put into action, our Product Owner becomes our client's main point of contact for ongoing production and flagging any issues, risks or challenges as they come up.

The myth still exists that software and complex systems can be planned out like building a bridge. That Gantt charts and timelines and feature sets are predictive of project success. This is not so, and is proven in the terrible track record of software projects that have failed, even though all these risk-reducing factors were in place.

zu has long ago recognized the importance of the Agile method for software building that accepts lack of predictability and instead focuses achieving project success by accomplishing important things first, by allowing the scope to be modified to make the most effective use of the constraints of time and money, to recognize dead-ends quickly and double down on good ideas that arise in the process of building. Transparency and approval for what is being done, what is done and what will be done are discussed in sprints with the client at regular and short intervals.

EVIDENCE AND DETAILS ABOUT THE PARTNERSHIPS, INCLUDING THEIR NATURE, TERMS, ACCOUNTABILITY STRUCTURE, AND FINANCIAL REQUIREMENTS.

On the 30th day of September 2018 The Mohawk Council of Akwesasne and zu.com communication Inc. entered into a contractual partnership between client and consultant. Please refer to the confidential annex for our Master Service Level Agreement and Memorandum of Understanding during the Finalist phase of the Smart Cities Challenge.

APPROACH TO PARTNERSHIPS THAT RETAINS COMMUNITY CONTROL OVER SENSITIVE AND PERSONAL DATA

Although zu is the contracted firm to build the technical aspects of the app/web portal, Mohawk Council will own the rights of the system and house and retain all data created with the system. All data collected, used, and disclosed will be managed under the Mohawk Council of Akwesasne stored on MCA internal data centers and servers. Please refer to our Preliminary Privacy Impact Assessment for an in-depth analysis of information privacy.

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Engagement

APPROACH TO ENGAGING WITH, GAINING ACCEPTANCE FROM, AND ONBOARDING RESIDENTS AND OTHER STAKEHOLDERS FOR PROJECTS THAT ENSURE ONGOING ALIGNMENT BETWEEN THE OUTCOMES AND THEIR CONCERNS AND NEEDS.

In order to understand where we are going in the implementation phase, it is important to understand where we have been over the Finalist phase. As strong believers in human-centered design, and designing with users and for your users, we have put Community Engagement at the forefront of our Smart Cities Challenge solution.

Over the past several months, we facilitated workshops with inclusive user groups, interviewed internal and external stakeholders, hosted community engagement events, and surveyed and user tested our prototypes with Akwesasne community members. The 5 stage approach brought by Design Thinking was executed by our partners at zu through a series of trips to our community. We completed the recyclable model several times to come to the prototyping and feature prioritization of our Community Application, narrow in on our Smart Greenhouse concept from several implementation ideas, and understand the true needs of the community for the execution of our Electric Public Transportation System.

To ensure a substantial amount and quality of community engagement, we leveraged the Design Thinking methodology and process, which is a **practical approach** to finding **creative solutions** to problems, inspired by traditional design methods, or more simply, an approach to problem-solving, which we will dig a bit deeper into and outline below.

"Thinking like a designer" means leveraging empathy, experimentation, and often technology, to produce solutions that help real people. Design Thinking is heavily rooted in Human-Centered Design, which emphasizes a user-first approach: finding out what users really need, then balancing solutions for those needs with the possibilities of technology, and requirements that define success for the business.

Several popular Design Thinking structures have emerged over the years. Most have the same basic underlying model:

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ATIA - 21(1)(b)



A common Design Thinking structure

1. Do Some Research

Research is critical to Design Thinking. Gathering information about a problem helps define the problem (or more typically, problems), so we can determine what the right problem is to solve. Design thinking research takes the form of interviews, usability testing, surveys, looking at analytics, and so forth. And research never really stops as feedback goes back in the top and then becomes the subject of feedback once more.

To ensure we look at user needs from multiple angles, we follow four research themes.

About Them - Takes the form of indirect research about Akwesasne and our community members living here. We looked at existing internal data, industry and community reports, and aggregated data. This indirect research included:

- Akwesasne Satisfaction and Experience Surveys
- Akwesasne Cultural Orientation Guides
- Mohawk Council of Akwesasne Department of Health - Annual Reports
- Mohawk Council of Akwesasne -Healthy Eating and Active Living (HEAL) Program - Indicator Reports
- Mohawk Council of Akwesasne - Strategic Plan
- Mohawk Council of Akwesasne - Comprehensive Community Plan

With Them - The most common method of "with them" research — or "with Us" in this case — is a simple 30 to 45 minute 1:1 interview in person or on the phone with the interviewee. "With them" interviews were undertaken with our community members themselves and also with groups and individuals that regularly interact with community members. In the finalist stage of our work, our "With Them" research included interviews with many distinguished individuals including:

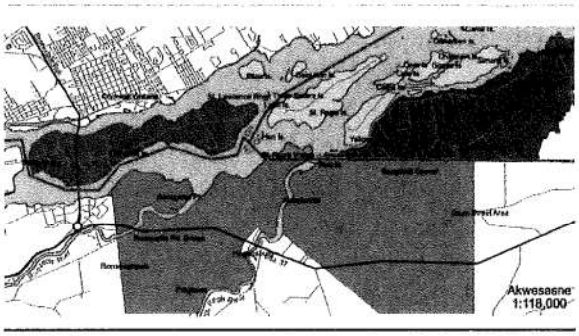
- Amber Montour (Manager, Wholistic Health)
- Sarah Thompson (RN, Supervisor)
- Della Adams (Traditional Medicine Employee)
- Lesley Bero (Program and Diabetes Prevention Manager)
- Karole Mitchell (Community Health Nurse)
- Cindy Francis-Mitchell (Assistant Director of Health)
- Andrew Francis (Data Health Management Coordinator)

During these interviews, we asked straight

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Key Insights



Map of Akwesasne and it's districts

FOOD INACCESSIBILITY

Inaccessibility to healthy food alternatives in Akwesasne is two-fold. First, our traditional Mohawk diet was based on growing, fishing and hunting, but has been severely damaged by pollution. Mercury levels are high in both the Saint Lawrence River and the surrounding soil. Community members have been cautioned to limit their diet of locally caught fish to one per year! We are told our traditional farming practices may produce unsafe food when grown on the polluted soil of Akwesasne. Second, due to the jurisdictional impediments, with border crossings causing delays in both direction of travel, healthy groceries and produce for many families can be up to a 30-minute commute away. With many community members living without vehicles, and with a scarcity of public transportation on the reservation, getting proper food regularly can be almost an impossible feat for many.

NETWORK ACCESSIBILITY

Being in a rural area of Ontario, the Akwesasne First Nation finds itself with insufficient mobile network capabilities. In all 3 districts, our community expresses frustration with so-called "dead zones" in many areas. This lack of contact creates barriers to our members receiving information regarding events, community activities, or communication for transport. Recognizing the value of our current efforts that made us a finalist of the Smart Cities Challenge, the Mohawk Council of Akwesasne has plans to leverage our efforts and take this as an opportune time to update Akwesasne's mobile infrastructure. Using their own internal budgets, the Mohawk Council will actively support the development of the Smart Akwesasne solution by providing necessary infrastructure.

TRANSPORTATION ACCESSIBILITY

Lack of public transit, combined with the lack of personal vehicles for many, makes it extremely difficult for Akwesasne people to gain access to opportunities offered in our three principal communities. As spoken to above, the opportunities we are most concerned about for community members are accessibility to food, to health services, to fitness locations and activities, to community events, and to other social services. With the implementation of our Smart Cities solution we will create accessibility to these opportunities. With the Smart Cities project in place our people will enjoy the possibility and option of traveling between districts, and with minimal financial burden. Accessibility has been determined to be one of our key strategies to reduce new cases of diabetes in the community.

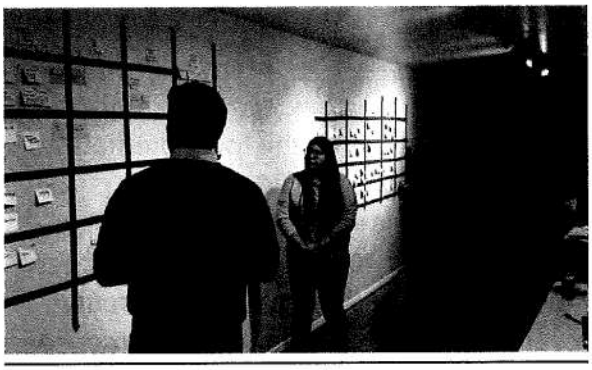
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forward, open-ended questions to gather information and insight while leaving the interview loosely scripted. This allowed our interviewers to adapt their line of questioning and vary which answers received more detailed follow up questions. We ask, for instance, What do they know about the client? Where they see their clients struggle? What questions are clients asking? What can be done to make the user's experience better?

"Be them" - The "be them" method allows researchers to gain empathy for a user's pain points by walking through an entire journey exactly as they would experience it, from start to finish, in the most natural context possible. As a part of our research phase we had MCA employees take us through their diabetes journey. Each journey started with being screened for diabetes, to find out if they were free of symptoms, pre-diabetic, or diagnosed diabetic. Then it was understanding the implications of their assessment, and how they were to manage their life in each case for the long term. This led the research team to an understanding of their journey, all the user's actions, touch points, thoughts, and emotions experienced by the individual through the process, often including their family's experience with the individual's journey. In approaching any particular event or process as a journey, fewer possibly important elements will be missed. More details will be noted this way, when subjects are asked to tell a story exactly how they walked through it, rather then if people are simply asked to describe what they remember about an experience.

2. Identitfy Insights

Once we finished the research stage, we sought to extract meaning from it. Pulling insights out of our research, and choosing the really important ones is an incredibly valuable step in setting the stage for effective ideation. Many folks typically want to brainstorm on ideas without adding new nuggets of information to the conversation, and so get nowhere new.



Journey Mapping workshop with Akwesasne community members and stakeholders

But Design Thinking has us start with a load of information, and then provides methods to identify insights efficiently and collaboratively. These insights then feed the creation of really innovative ideas. In our workshops with MCA stakeholders we used the techniques of the practice, we group shared and affinity mapped to identify patterns and themes. We wrote and edited challenge statements to concentrate on the most important underlying challenges of diabetes.

Our preliminary research and stakeholder workshops led us to the following key insights.

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Ideation Workshop on 'How Might We' statements with Akwesasne community members

WESTERNIZATION

Since the imposition of Western culture on our community, the Mohawk people have been subject to drastic change in their daily diet. First, many community members have moved away, not just from their home territory, but from their traditional lifestyle and food sources. There they are eating the fatty and carb-heavy alternatives that are convenient and cheap, whether from chain restaurants or other seemingly economical options. Second, the fast-paced, consumption-oriented lifestyle now everywhere is still very new to our culture. Healthcare workers, particularly those involved from a diabetes prevention/ management point of view state, observe that the people of Akwesasne are practicing less and less the holistic and traditional approaches to medicine. Our people increasingly have come to accept the disease that comes with westernization and western ideas about health. We become used to taking pharmaceutical drugs to combat metabolic and diabetic disorder, rather than look for answers in our traditional approaches to health.

CHECKUP FREQUENCY IN HEALTH & DENTAL

It is apparent that community members, particularly men, do not see a doctor regularly. This of course contributes to poorer health outcomes. Many factors may be in play with this behaviour including: pride and the desire to show strength; a genetic predisposition that allows Mohawks to actually handle pain better than others; the absence of a male doctor within the community. Again, lack of options for public transportation also plays a key role in this exacerbating this unfortunate infrequency of interactions with health and dental services.

HEALTHCARE SYSTEM DISCONNECTION

Further difficulties arise from the complicating reality that Akwesasne people and their families —though one community of Mohawks — live in 3 jurisdictional areas: Ontario, Quebec and the state of New York where they are dual-citizens. It is not hard to imagine the complications this causes our own internal health care efforts: having to interact with three separate systems none of whom are recognized for ease of use. Our people may be using health and dental services from multiple institutions located in different jurisdictions. And so we find many of our health client's records to be inaccurate and/or incomplete. This causes an overall lack of transparency, and makes difficult our ability to even assess where we are as a community health wise. Issues in terms of data consistency, information collection and information aggregation make it difficult to even begin to interpret the overall system's performance in a holistic way. How will we

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find insights worth acting upon without good information?

The poor state of record keeping caused by these overlapping jurisdictions is extremely straining on healthcare professionals. These folks are trying to help and are striving to accurately diagnose the individuals they see. But they just don't have the basic information of an accurate medical history to work with. We need to give our health care professionals, and the people themselves, complete and accurate baseline health records. Knowing where we are as a system and as individuals is key to knowing where to go and whether we are heading in the right direction. Health assessment is based on measurable data, and the health of the system is based on measuring the improvement in outcomes. Improvements and consolidation are needed in the medical records of our people. We cannot expect that this improvement will be provided by the three medical systems we deal with. This centralization will be something we need to build ourselves. It will be important in our battle to reduce new cases of diabetes in our community.

[redacted]

LOSS OF TARGET DEMOGRAPHIC FOLLOWING PRIMARY SCHOOL

Key target audience

Individuals from 12-25 are our primary target demographic for preventing new cases of diabetes. When this cohort are in our community and in school on the reserve, The Department of Health has the opportunity to educate them. Given our people's increased susceptibility to metabolic diseases and diabetes, we have to act proactively with our young people to prevent new cases. Akwesasne is home to three Akwesasne Board of Education Elementary (AMBE) Schools. These schools include Ahkwesahsne Mohawk School, Kana:takon School, and Tsi Snaihne School. While in school our children receive instruction about nutrition and health promoting lifestyles, learning to make habits of healthy choices. Following graduation from our schools, however, our students only secondary schooling options are off reserve. Our losing access to them following primary education means we have lose our opportunity to continue training them for long term health. This insight identifies a barrier we target to overcome.

GOAL OF INSIGHTS

Our goal of identifying insights is to better define the problem(s) and understand what are we really trying to solve. Insights set the stage for idea generation. But before we generate ideas we use an interim step to reframe insights as questions.

The How Might We framework is particularly effective for inspiring creative solutions for two reasons:

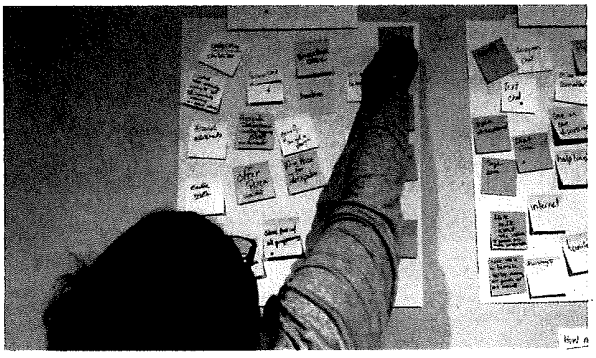
1. Its phrasing implies that a solution is possible.
2. It's often easier to craft solutions when you're trying to answer a specific question.

Collaboratively with zu, we crafted How Might We Statements. These are intended to create a road map that will lead us to generate new ideas to help the Akwesasne community.

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Our How Might We Statements included:

- How Might We reduce the time and distance to healthy food?
- How Might We create a solution that bridges the gap between traditional and modern medicine?
- How Might We make people feel more comfortable discussing sensitive topics with health care professionals?
- How Might We maintain health education and contact with our people through High School?
- How Might We motivate people to take advantage of existing programming?
- How Might We encourage people to get screened for pre-diabetes earlier?



'How Might We' Statements being explored during Akwesasne community workshop

3. Come up with some ideas for solutions

Referencing our How Might We Statements, our next step was coming up with ideas to solve them. There's seemingly no end to the number of ways to approach idea generation (aka brainstorming or ideation). Ideas can be generated individually, as a group, or both. Ideas for solutions can be written, drawn, built in 3D, acted out, etc. The key is to focus on generating lots of possibilities, not necessarily trying to find the silver bullet solution right off the top.

Using a combination of individual and group ideation tends to result in the best solutions because:

- Individuals working alone can focus their thoughts to come up with more fully formed ideas.
- People working in a group can then use the individual ideas as springboards to evolve their own idea, build on another's idea, or come up with more new ideas.

In a small group session with health care professionals, council representatives and community members we began writing, drawing, and acting out solutions. This resulted in nearly a hundred different solutions to the above How Might We statements. We derived solutions that would make food and healthcare more accessible through various approaches including transportation improvements, diabetes prevention education (choice), cooking classes (variety). We had ideas regarding increasing programs offered that promote healthier lifestyle and provide

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fitness resources, including tweaking our competitive nature with district games, where individuals compete against one another in sport and art. We envisaged anonymous helplines for health care advice and direction. We identified the implementation of greenhouses as a good idea: they are increasingly practical to operate; they would be an educational enhancement if associated with our schools; they would increase our accessibility to healthy produce. Additionally, moving our agriculture into greenhouses would decrease our exposure to toxins in the food we have no choice but to grow in our now polluted soil.

This group session produced over a hundred ideas. Participants were energized by the opportunity to develop their own ideas, to build on another's idea, and to see their idea taken further than they imagined when the whole group contributed on theirs. We saw useful innovation happen and produce good ideas. We used Design Thinking approaches to make choices as a group. We voted on favorites to focus down on the best of the hundred. We took the finalists further and worked until these most viable ideas became prototypes.

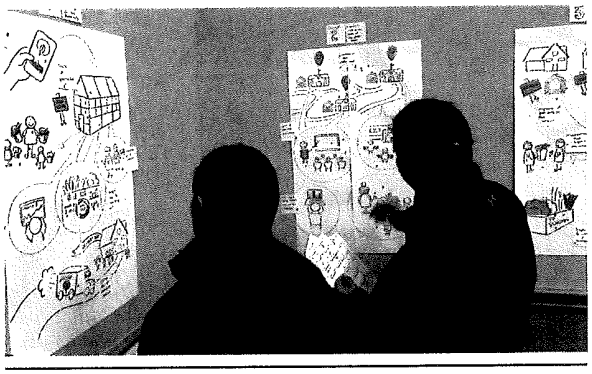
4. Try ideas out

Prototyping possible solutions is the least expensive way to fail, and the fastest way to learn. Prototypes can be digital, paper, or a combination of any kinds of materials, sometimes looking like arts and crafts. Participants can prototype a process, a pamphlet, a script. From our ideation session, we sketch-prototyped, and digitally-prototyped several concepts based on ideas we had discovered in the stakeholder engagement from our workshop.

SMART GREENHOUSE SYSTEM SKETCHED-PROTOTYPES

Through our workshops it was evident that the implementation of a Smart Greenhouse System was crucial to bringing healthy, affordable and accessible food to the community. To determine a strategy which would create the best benefit for our community, we narrowed the options down to three:

- 1 Large Community Greenhouse supporting all districts
- 3 Medium Community Greenhouses supporting each district
- Several neighbourhood operated community greenhouses supplying the homes in those neighbourhoods.



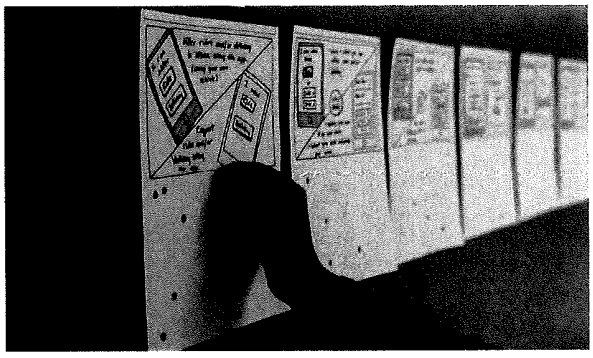
Smart Greenhouse System Prototype during community engagement

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ELECTRIC TRANSPORTATION SYSTEM SKETCHED-PROTOTYPES

Likewise, our ideation workshops made us aware that some form of transportation system in the community was going to be necessary to our Smart Cities approach. This led us to prototype multiple concepts to potentially solve this clear barrier to many of the issues we identified as insights. These transportation solutions included:

- Ride-Sharing System connecting individuals who can offer rides with individuals who need them.
- MCA operated and subsidized Smart Taxi Service



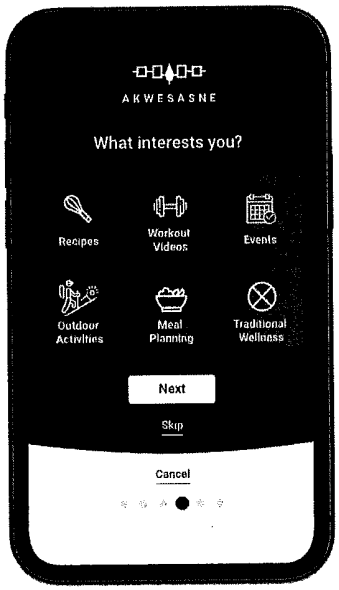
Electric Transportation System Prototype during community engagement

AKWESASNE MOBILE/WEB APPLICATION DIGITAL PROTOTYPE

In the finalist phase, a goal for the combined team was to create a working prototype of the Akwesasne Community Application. The application will allow the necessary communication and coordination for the whole Smart Cities approach to work, like glue for all the parts. Prototyping is a major milestone in the Design Thinking approach to building a product or service, as it is the artifact representing the culmination of all the previous work, and is a clear target for what the next stages seek to create. So, following Design Thinking exercises with users where features were developed by users, early versions of our application prototype was created by our partners (zu) in AdobeXD. This online, interactive version of our app allowed community members to navigate through the its functions using their devices in ways close to having a working application.

This digital prototype, a replica of the application, demonstrates initial sign up and login screens, as well as 4 tabs: Wellness, Nutrition, Fitness, and Community. Sub menus for these tabs each bring additional screens showing how these new opportunities to Akwesasne will work. The application, which is expected to expand in capability over time, provides room for expansion of functionality in future phases. With extensive engagement and feedback from the community to ensure proof of concept, followed by cycles of iterative prototypes produced and shared with each round incorporating feedback followed by more user-testing — we produced a prototype interface. On the following page is a link to the the Akwesasne Community Application prototype.

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- Traditional and modern health resources in the forms of videos, blogs, podcasts, and recipes
- Booking of traditional, holistic and community healthcare appointments
- Access and storage CANRisk survey results, with prompts to take necessary action
- Compete in activities alone, or with friends in order to gain rewards
- Events and programs page to stay up to date and aware of opportunities in the community

CLICK THE LINK TO VIEW THE PROTOTYPE

https://adobe.ly/2ERy3X3

- Features and functionality of prototype include:
- Login screens with terms of use, privacy policy including collection, use, and disclosure messaging
- Ordering and payment of the Smart Delivery Service (for food deliveries from the Green Food Bag and Smart Greenhouses)
- Requesting and payment of rides from the Electric Public Transportation System

5. Get some feedback

Getting feedback from our community on these more mature prototypes was the next critical step to ensure our solution would meet their expectations. The majority of our this wider community feedback and user-testing would be completed at our community engagement events.

We were aware of the lack of transportation limiting participation for many. So we made sure to host community engagement events in each of the three districts so there was ample opportunity for everyone to contribute to our Smart Cities Solution. For both the Smart Greenhouse System and the Electric Public Transportation System, we used a multifaceted approach to get good feedback from users. We mobilized a number of strategies:

Interviews - Members of our team and zu's were stationed around the meeting space in

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order to answer questions, pose their own questions back to users and to follow up to enquire why certain notes were given or decisions made.

Dot voting - Allowed community members to simply leave adhesive dots on parts of the solution sketch they really liked or approved of.

Feedback Notes - Gave users the opportunity to provide feedback by writing comments on adhesive notes and sticking them anywhere on the sketches. Their comments led to other participants also dot voting on the stickies themselves, giving approval or making further suggestions, all in a casually collaborative and efficient way.

Voting box - With multiple concepts and many participants, we simply wanted to give individuals the ability to vote for their overall favourite concept. This gave us an idea of which concept would be likely to benefit the community the most, and so be adopted for actual use by them.

This resulted in a more flushed out application prototype that we were extremely excited to get it into the hands of our users. Gaining feedback on this now more mature prototype came through a number of methods:

prototype testing

1:1 user testing - Members of the zu team had community members work with the application under one of our team's observation. This provides some the highest quality insight into the apps success in the presentation of features and functionality.

Dot Voting - As in our previous use of dot voting on interface sketches, we now made printouts of the application screens, taped them to the wall and encouraged community members to vote on their favourite features.

Feedback Notes - Feedback notes gather more specific insights, new ideas and enhancements — then just votes. And participants enjoy the ability to leave feedback and suggestions right next to interface features, and to see what other folks are saying. This is a high quality feedback method providing insights very useful to the designers.

Interviews - Members of our team and zu's were again standing ready to answer questions, and to engage in brief conversations to clarify exactly the nature of the participants opinion, idea or critique.

Getting feedback on our prototypes was in essence just more research. We gathered information about how people use the solution, where they stumble, what they liked, what they disliked, and things we can make better. Design Thinking has led us to a Smart Cities Solution that we can confidently say was designed and created by and for the community using it. This engagement with users is the missing step in so many software projects that fail. Our extensive efforts in community engagement on the app greatly increases our potential for success.

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Data & Privacy

PRELIMINARY PRIVACY IMPACT ASSESSMENT (PIA) OR PRELIMINARY RATIONALE ANALYSIS (PRA) WITH EVIDENCE THAT RELEVANT PRIVACY AUTHORITIES WERE CONSULTED AND THEIR GUIDANCE WAS CONSIDERED IN ITS DEVELOPMENT

Following an in-depth analysis of our Smart Cities Challenge solution(s), and multiple meetings with the Privacy Commissioners of Canada, Ontario, and Quebec, we are confident in taking the appropriate measures to ensure the minimization, anonymization, consensual and security in the collection, use and disclosure of information. To both implement and maintain an effective future-proofed solution, while constantly measuring our progress, a number of PII and non-PII data points will need to be collected. Within our PPIA, we highlighted ways in which we intend and commit to comply with the Personal Information Protection and Electronic Documents Act.

Types of methods of data collection, generation, analysis, storage and transmission, and plans for re-use, re-distribution, derivative production, archiving, and preservation that reflects the entire data lifecycle in project design.

As members of the communities ourselves, and proud of Akwesasne individualism, we approach the collection, generation, analysis, storage, and transmission of data as if it were our own.

Collected - Personal information will be collected within the application through. This data will be gathered anonymously from inception and in aggregated form to gain insight into the progress of the community. Collected information will include personal information, aggregated information, and device information.

Personal Information - Full name, Home address, Email address, Credit Card Numbers, Age Range, Telephone and Login Details. This information is fully encrypted at first point of contact, in transit and at rest.

Aggregated Information - Gender, Race, Age Range, Workplace, Height & Weight, BMI, Waist Circumference, Physical Activity Levels, Diet, Fruits and Vegetable Intake, Blood Pressure, Blood Sugar Levels, Family History in Relation to Diabetes

Device Information - Device IDs, Internet Protocol (IP) address, Unique Device Identifier, Cookies tracking, and Location Tracking (While using the app)

Adept in the security of information, our partners, zu, have been ensuring the safe

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disclosure of information for over 23 years. All data surfaced and in transit between the application and Mohawk Council of Akwesasne Servers, will be managed through;

- SSL encrypted communication for all data in transit.
- Credentialed access to sensitive information at all touch points.
- Strong, AES encryption of sensitive data at rest.
- Secure, off-site storage of data backups
- Logical, and physical separation of collected PII and de-identified, aggregate data that will power community dashboards and open data initiatives.
- An extract, transform, load (ETL) step to pull data from the community application database into a separate repository of information used to generate redistributable reports that are devoid of PI.

Use - The use of the collected information will ultimately allow us to measure the success of our Smart Cities Solution. It will provide us insight into the communities progress enabling us to adapt our approach in areas of low participation and capitalize on areas of high participation. All information will be fully encrypted through SSL, and in an aggregated form to not tie information to an individual or key identifier.

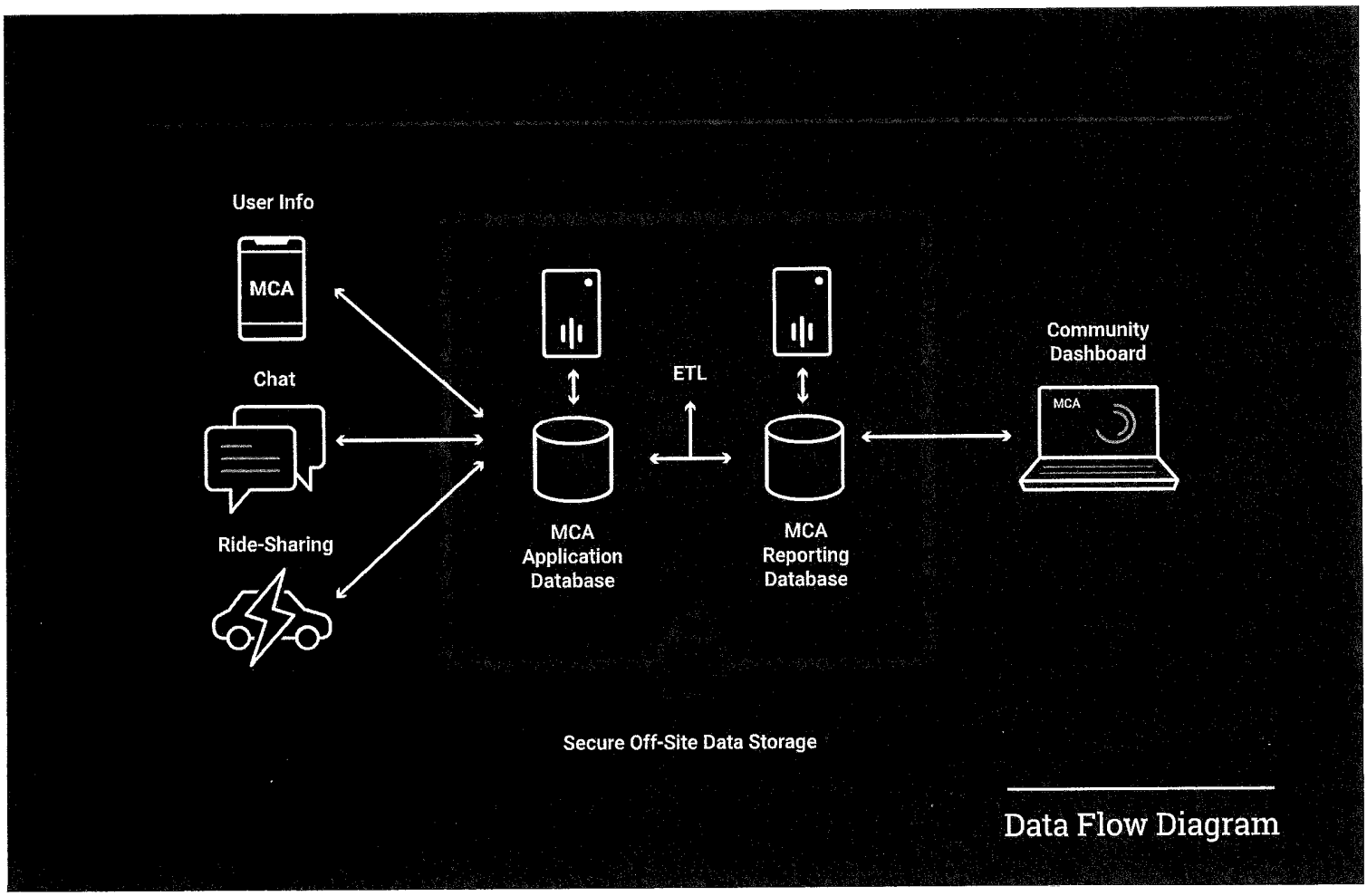
Disclosure - All information not highlighted as aggregate information, will be fully encrypted and untied to the individual at initial contact, in transit and at rest. Personal information will not be made available to any third parties but only Mohawk Council of Akwesasne internal trend analysis and measurement

Efforts made to integrate security and privacy considerations into project design, particularly those that were raised users, residents, and other stakeholders.

Balancing design standards, user experience, and the privacy implications resulting from the former are all considerations necessary for the implementation of our Community Application. Below we highlight several best practices to integrate security and privacy considerations into our project design.

- Identification of what personal information is being, or may be, collected about them at time of consent
- Identification of all purposes for which information is collected, used or disclosed at time of consent
- Provide information to individuals in manageable and easily-accessible ways
- Multi-Factor Authentication
- "Just-in-Time" privacy notice where possible
- Treating consent as a dynamic and interactive process.
- Be positioned to demonstrate - either in the case of a complaint from an individual or a proactive query from

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Data Flow Diagram

a privacy regulator - that we have a process in place to obtain consent from individuals.

- Obtain consent from a parent or guardian for any individual unable to provide meaningful consent themselves
- The ability of an individual's right to withdraw consent
- The ability of an individual's right to review and update personal information logged

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Budget & Project Breakdown

zu's projects are tracked hour by hour, day, by day, week by week and month by month. Their time tracking system called Replicon records their time in 15-minute increments. The time spent is fed into burn and resource charts that are scrutinized against detailed work plans produced at the beginning of each production phase and broken down further by each week by zu's experienced product owners. The PO's work with zu's designers and developers to further break down work on key features into bite-sized "user stories", that are then used to create tasks in Jira and Replicon for assigning work and recording time respectively.

The Akwesasne team is kept in the loop via zu's weekly progress reports that feature a cost breakdown to date, budget forecast for the week ahead and expected spend upon completion. Risks are flagged in the report and discussed in weekly production meeting with the Akwesasne team. A decision log is kept by zu to maintain transparency throughout the project. Between their time tracking system, weekly reports and weekly status meeting, we'll be kept informed of risks, spend totals and decisions to ensure proper cost control from kickoff to launch. Work is completed upon our approval with production billing rate of $140/hr and a standalone strategy rate of $175/hour.

Our Smart Cities Solution will be assembled using, really no experimental technologies or untested software approaches. Therefore, our estimates are straightforward and not based on speculative math. Nevertheless, public tenders under the oversight of the before mentioned committees should provide us with competitive prices for the equipment and installation of the equipment we need to build the Electric Public Transportation and Smart Greenhouse Systems.



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APPLICATION & DASHBOARD	HOURS	SUB-TOTAL
Phase 1: Strategy & Validation Stage	150	$175,875.00
Phase 2: Design	230	$273,000.00
Phase 3: Development	355	$509,250.00
Phase 4: Dashboard Development	240	$252,000.00
Subtotal	**975**	**$1,210,125.00**
With contingency 10%		$1,331,137.50
Taxes (11%)		$146,425.13
Travel Costs & Expenses		$75,000.00
Application & Dashboard Implementation Total		**$1,552,562.63**

GREENHOUSE IMPLEMENTATION ESTIMATE	SUB-TOTAL
Greenhouse Engineering and Design	$150,000.00
Ahkwesahsne Mohawk School Greenhouse	$300,000.00
Kana:takon School Greenhouse	$300,000.00
Tsi Snaihne School Community Outreach Greenhouse	$450,000.00
Curriculum Specialist (3-Year Term)	$240,000.00
Subtotal	**$1,440,000.00**
Taxes (11%)	$158,400.00
Greenhouse Implementation Total	**$1,598,400.00**

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ELECTRIC TRANSPORTATION SYSTEM ESTIMATE	SUB-TOTAL
Electric Cars (12 x $45,000 each)	$540,000.00
Electric Car Charging Stations (6 x $5,000 each)	$30,000.00
Natural Resources Canada Rebate	($15,000.00)
Electric Bus	$300,000.00
Subtotal	**$855,000.00**
Taxes (11%)	$94,050.00
Transport System Implementation Total	**$949,050.00**

OVERHEAD COSTS	
Project Coordinator Salary - 2 Year Term	$200,000.00
Project Assistant Salary (x1) - 2 Year Term	$150,000.00
Greenhouse Interns (x3)	$150,000.00
Driver Wages	$100,000.00
Subtotal	**$600,000.00**
Admin Management (10%)	$60,000.00
Taxes (11%)	**$72,600.00**
Overhead Total	**$732,600.00**

PROJECT COSTS	
Application & Dashboard Implementation Total	$1,552,562.63
Greenhouse Implementation Total	$1,598,400.00
Transport System Implementation Total	$949,050.00
Overhead Total	$732,600.00
Project Total	**$4,832,612.63**

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FINALIST GRANT EXPENDITURES	
zu Strategy & Design Consultation	$176,200.00
Community Engagement Events	$29,500.00
Project Coordinator Salary	$8,000.00
Travel	$7,000.00
Subtotal	**$220,700.00**
Taxes (11%)	$24,277.00
Expenditure Total	**$244,977.00**

** Remainder of budget will be used through the spring finalist stages, including presentation and travel*

Implementation Phase Requirements

While our Challenge couldn't be more significant to our community, the proposed Smart Cities system does not require special attention in regards to either municipal, provincial, or federal legislation, nor for reporting or policy requirements. Our consultation with Indigenous groups, since this is ourselves, is about ensuring we are inclusive of the many voices of our community. To that end, we have relied on many types of engagement to determine our initial approaches, and as touchpoints at every step of the planning and process of solution delivery. The most complex areas of legislative impact are around personal data privacy, and the risks of trying to build a comprehensive understanding of the state of our people's health. This is covered in our Preliminary Privacy Impact Assessment.

Community Employment Benefit

Our Smart Cities project will provide many benefits towards new skill development, as well as full and part time labour opportunities. Part of the value of these employment opportunities will be every participant knowing that the work they are involved in directly benefits our community and has the higher purpose

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of improving health outcomes and quality of life at Akwesasne. The Electric Public Transportation System will create employment through MCA employed Smart Taxi drivers, and bus drivers. The Greenhouse will create opportunities for all ages and ability levels, providing positions in horticulture engineering, gardening, plumbing and electrical, as well as project and inventory management. Volunteers will also be needed and will receive exposure to trades and professions not currently in Akwesasne. The Akwesasne Community Application will also create numerous opportunities. Our Mohawk Council of Akwesasne Information Services team will undoubtedly need more help, and will towards those graduating from Ontario Emerging Jobs Institute for applicants. Hosting, maintaining and enhancing a combined mobile and web-based application like the Akwesasne Community Application requires all manner of skills. These include programming for all the devices and frameworks in use, database management, server management, system security and privacy, CMS management, social feed integrations, location management, training, and more. Some areas will require a depth of expertise, others will be necessary at shallower depths of experience. We are committed to not only innovating the products and services of our community but also developing the expertise and education of our people. It is time for us to make use of the technology that is key to our moving forward with our challenges and opportunities, and to become self-sufficient with these skills.

Commitment to a Climate Lens Assessment

Should we have the opportunity to move forward with the implementation phase, we will commit to completing the Climate Lens Assessment. This will make more sense after the public tenders for solution equipment have been received, and choices made about which equipment provides the best value at that future point in time. We are confident our Smart Cities approach will bring positive climate impact, but will confirm the expected measured effects when appropriate details for the analysis are available.

Risk in Regards to Implementation Plans and the Regulatory Environment

We do not foresee risks to our Smart Cities project in failing to meet relevant municipal, provincial, and federal reporting and legislative requirements. Granted there are always risks associated with making mistakes in regards to construction of buildings, and the Smart Greenhouses are structures. There are information privacy risks. There are labour standards rules. Their are employment related taxes to be paid. There is general reporting to the various Revenue Collection agencies. But none of these seem either notable as unique to our project, nor are new risks that our community does not already face.

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Thank you for taking the time to read our proposal. We hope you have found our plans to improve the health of our people through this combination of Design Thinking, Smart Technologies and Web-based Software to be practical, achievable and worthy of being taken to fruition.

Our consultation with Indigenous groups, since this is ourselves, is about ensuring we are inclusive of the many voices of our community.

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Appendix A

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SCHEDULE "A" to MASTER SERVICE AGREEMENT
STATEMENT OF WORK: SUPPORT AND OPTIMIZATION

RE: Website Support and Optimization Service Agreement between the Mohawk Council of Akwesasne. (the "Client") and zu.com Communications Inc. (the "Webmaster") dated effective the 30th day of September 2018.

Support and Optimization Overview

Retaining long-term value from any digital asset requires a commitment to supporting the software development lifecycle. The increasingly rapid pace at which web technology and best practices, online threats and user expectations evolve make it hard to keep up. Our support and optimization model is designed to keep MCA team members aware of issues affecting site health and security, opportunities for iterative enhancement and potential opportunities to leverage new trends or technologies.

We structure our approach to long-term viability in two ways. The support fee enables your website to be flexible and protected from the changing nature of technology and online threats while the optimization budget allows your website to evolve alongside your corporate and communications strategies. Together, these two approaches to health and optimization ensure the successful transformation of your digital asset over time.

Definitions:

Bug – A bug is defined as a defect or defects in the existing code that produces an incorrect or unexpected result.
Existing code – Refers to code in use at the commencement of support and optimization agreement.
Minor version – Point sequence updates to supported, dependent software. Ex. major.*minor*
Major version – Whole number sequence updates to supported, dependent software. Ex. *major*.minor.

Schedule A: Budget

Annual Support Budget: Fixed TBD broken into a TBD monthly fee.
Monthly fee includes the services outlined in Schedule B: Support Services. The scope of services will be evaluated annually from the initial start date as the website may grow and the scope of support services and fees may be expanded.

Annual Optimization Budget: Recommended TBD broken into a TBD monthly forecast.
The annual optimization budget will include the variable costs dedicated to building out new features, website enhancements and major system upgrades discussed in Schedule C: Optimization Services. Optimization work will only be completed upon client approval at a production billing rate of $140/hr and a standalone strategy rate of $175/hour.

*Any changes in costs as a result of changes to hosting arrangements at the request of the client will be reflected in changes to the monthly fees.
*Variable cost will be affected based on US dollar conversion and hosting usage.

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* Any work related to hosting maintenance including server configuration, server maintenance and host provider management will be recorded hourly and billed to the optimization budget at a rate of $140/hr.

Schedule B: Support Services

Support Services Scope:

1. Monthly proactive performance testing and bug diagnosis
    a. New minor version and major version browser/OS testing and 3rd party integrations monitoring for updates or security issues.
    b. Run any automated tests as well as manual testing per code release.
    c. Generate bug report; prioritize non-urgent bugs; catalogue major version browser and OS issues for optimization.

2. Bug resolution
    a. Bugs will be catalogued and prioritized based on services levels outlined in Schedule D.
    b. Bugs will be fixed based on priority.
    c. Minor version browser/OS and 3rd party integrations bugs will be resolved under the fixed support fee outlined in Schedule A.
    d. Major version browser/OS and 3rd party integrations upgrades covered under optimization budget outlined in Schedule A.

3. 3rd party integrations support
    a. Any fixes required to ensure 3rd party integrations are up to date, secure and functioning.
    b. 3rd party integrations may include:
        i. Google Maps
        ii. YouTube
        iii. Google Analytics

4. Drupal Support
    a. Minor version updates and security patches
    b. Deployment support



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c. Administration View bug diagnosis and resolution

d. Additional local environment setup for ensured redundancy

5. Quarterly Services Reporting

a. Incident tracking and diagnosis

b. Analytics review

c. Document major risks

d. Document known 3rd party feed updates or enhanced feature availability

e. Document new browser/OS and device releases

6. Supported Browsers and Devices:

Monthly Testing - We currently test for the following operating systems and devices:

Device	Versions	OS
iPhone	SE, 8, 8+, X	iOS 11.0+
iPad	Mini, 4th Gen, Pro	iOS 11.0+
Android Phone & Tablet		Android 6.0+

Note: A review of website traffic by browser and OS will be conducted to determine whether backwards compatibility is required. If any one browser or OS makes up more than 10% of the overall traffic, zu will ensure the website is optimized for that instance.

Browser	Versions
Internet Explorer	11.0+

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Safari	Latest version
Firefox	Latest version
Google Chrome	Latest version

Schedule C: Optimization Services

While Support Services ensures asset health, Optimization maintains relevancy, strategic alignment and future growth opportunities. If assets are left stale they will never achieve the long-term value intended for the business or users. We recommend a balance between investing in system upgrades and feature enhancement to keep pace with the evolving nature of web technology and user expectations.

1. Website optimization:
    a. Custom feature development
    b. Section or website-wide content updates
    c. Major version Drupal upgrades (ie. 8.0 – 9.0)
    d. Additional 3rd party tool integration, API development, microservice integration
    e. Production design elements
        i. Infographics
        ii. Data visualization
        iii. Print materials
        iv. Heuristics reviews
    f. Website template adjustments
    g. Website main navigation changes
    h. Strategy services: user testing, stakeholder engagement, design sprints, product design, and development

2. Microsite development and optimization:

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a. Additional microservice websites for campaigns or special needs

b. Development of additional websites such as a dark site for crisis communications, community websites, further form integrations

Schedule D: Service Levels

zu business hours are 8:30 AM – 4:30 PM, Monday-Friday

Team - The developers responsible for performing support services include senior zu team members including one Acquia Drupal certified developer.

Urgent Requests:

1. Impact on all users on given platforms.
2. Website or application is non-functioning or severely degraded.
3. Loss of functionality to an entire section of the website.
4. Notice must be emailed to MCA@zu.com to ensure all members of the production team and support staff are notified.
5. zu will respond within one (1) hour with an estimated timeline to address such a request within business hours.
6. Urgent requests will be resolved at the earliest possible time and as quickly as possible. The team will work continuously until a resolution is met.
7. Urgent requests brought about by actions of the Mohawk Council of Akwesasne, its host provider or 3rd party participants will be resolved. Billing costs associated with these issues will be reviewed on a case by case basis and possibly fall outside the support services budget.
8. Should an urgent request be identified and communicated to zu outside of the stated business hours, and should the issue be deemed unable to be mitigated through a short-term rollback, zu Operations will then assess the next steps on a case-by-case basis in consultation with the Mohawk Council of Akwesasne to determine an appropriate resolution.

Non-urgent requests:

1. Impact on one (1) or more user groups or any device platform.
2. Application continues to work but non-critical functionality is unavailable. Restoration is not time sensitive.
3. Application continues to work but little non-critical functionality is unavailable.
4. Request is made in Zendesk or, if Zendesk is not being leveraged, a request is emailed directly to the Product Owner PO.



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5. Response within eight (8) hours on a timeline for an estimate within business hours.
6. Non-urgent requests will be prioritized and resolved based on a mutually agreeable schedule.
    a. This doesn't include downtime that might occur due to the host provider.

MCA Responsibilities:

1. Grant zu access to MCA's facilities, information technology infrastructure, information and data, and personnel for the provision of the services.;
2. Maintain backup data, and perform all other tasks required or recommended by zu to prevent or mitigate any loss or damage to MCA's data or other information arising out of the provision of the Services;
3. Comply with all reasonable procedures and requirement of zu to facilitate and assist in the provision of the Services
4. Perform those tasks assigned to MCA conscientiously and using qualifies and competent personnel;
5. Active communication with the zu team, and bi-weekly meeting attendance;
6. Drupal CMS content authoring & publishing, including;
    a. The editing of existing and addition of new content and documents
    b. Creation of new pages using existing content and page types
    c. Management of Content Menu Settings and URL Paths
    d. Rearrangement and addition of menu items

Schedule E: Quarterly Performance Reporting

Availability (Current Month; Previous Month; YTD):
- Service Time
- Unplanned Downtime Duration
- Maximum Downtime Duration
- Number of Downtime Occurrences
- Total Page Failures

User Experience (Current Month; Previous Month; YTD):
- Average Response Time
- Maximum Response Time

Capacity (Current Month; Previous Month; YTD):
- Average User Capacity
- Maximum User Capacity

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- Completed Pages
- Bandwidth Consumption

Performance (Current Month; Previous Month; YTD):

- Average CPU Usage
- Maximum CPU Usage
- Average Latency
- Total Page Hits
- Average Page Load Time
- Maximum Page Load Time

IN WITNESS WHEREOF the parties hereto have executed this Statement of Work to be effective as of the 1st day of January 2019 ending the 31st day of December 2019.

Mohawk Council of Akwesasne	zu.com Communications Inc.
Per: _____	Per:_____
Title: _____	Title:_____
Signature: _____	Signature: _____

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Appendix B

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Akwesasne Area Management Board

P.O. Box 965
Cornwall, Ontario K6H 5V1
Tel: 613-575-2626 Fax: 613-575-2863 www.aamb.ca

March 4, 2019

Rhonda Adams,
Manager, Information Services,
Mohawk Council of Akwesasne,
PO Box 579,
Cornwall, Ontario
K6H 5T3

She:kon Rhonda,

Thank you for your email concerning the Akwesasne Smart Cities Proposal. I have been watching the development of this initiative with great interest given the tremendous possibilities and benefits Smart Cities could have for Akwesasne.

The Akwesasne Area Management Board (AAMB) would be pleased to participate in the Smart Cities Proposal by becoming a partner in training and employment opportunities. The AAMB offers a variety of programs and services that could dovetail with Smart Cities including Internships; Training on the Job (Job Opportunities); and Youth Initiatives to engage young people. Our goal is to work with employers to expand the range of opportunities for Akwesasne workers and clearly the initiatives proposed in Smart Cities would match this objective.

The Akwesasne Area Management Board looks forward to receiving more information on the Smart Cities proposal and extends best wishes on the development of this important program.

Skennen,

AKWESASNE AREA MANAGEMENT BOARD

Russell Roundpoint,
Executive Director.

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Saint Regis Mohawk Tribe

Amberdawn Lafrance
Saint Regis Mohawk Tribe Environment Division
Akwesasne Cultural Restoration Program

March 4, 2019

Rhonda Adams
Project Lead Smart Akwesasne
Manager Information Services
Mohawk Council of Akwesasne

Dear Rhonda Adams:

I am writing to voice my full support of the Smart Akwesasne Project and their proposal to the Smart Cities Challenge.

The Saint Regis Mohawk Tribe's Akwesasne Cultural Restoration (ACR) Program was established in 2013 as a result of the St. Lawrence Environment Natural Resource Damage Assessment Settlement. The name that we have chosen for ourselves in our language is "Áse Tsi Tewá:ton" which means "make it new again". This name and its meaning describe what we are doing for Mohawk culture through the program; we are making it new again, and bringing new life to our traditions and cultural practices and strengthening the connection of our people to the land. The program is overseen by the Akwesasne Restoration Commission which is made up of representatives from the community, the Mohawk Nation Council of Chiefs, the St. Regis Mohawk Tribe, and the Mohawk Council of Akwesasne. The main component of "Áse Tsi Tewá:ton" is the Cultural Apprenticeship Program which is a four-year program in traditional, land-based, cultural practices. We hired eight Cultural Practitioners in the categories of Water, fishing and the use of the river; Horticulture and traditional foods; Medicine plants and healing; and Hunting and trapping. The program graduated 13 apprentices in 2017 and held over 150 community workshops since 2014.

Two goals of the Smart Cities proposal can be directly supported by the ACR program: Greenhouses and Cultural Awareness. The ACR program has the resources to offer traditional teachings related to Indigenous food sovereignty, Haudenosaunee heirloom seed saving, traditional gardening and harvesting practices, Kanien'keha language, and curriculum centered on these teachings.

Sincerely,

Amberdawn Lafrance

Amberdawn Lafrance
ACR Program Manager

71 Margaret Terrance Memorial Way
Akwesasne, New York 13655
Phone: (518) 358-2272
www.srmt-nsn.gov

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Akwesasne Freedom School
Via Mohawk Nation

P. O. Box 290
Rooseveltown, NY 13683

P. O. Box 1832
Cornwall, ON
K6H 5R7

TL.: 518-358-2073 office@freedom-school.org

To: **Infrastructure Canada Smart Cities Challenge**

From: **Kanerahtens Tara Skidders**
Akwesasne Freedom School Office Manager

Re: **Proposal on Curriculum Development for Greenhouses at schools**

Date: March 1, 2019

Tekwanonhweratons (greetings),

I hope this letter reaches you in good health and spirits. I am writing on behalf of the staff, students and families of the Akwesasne Freedom School. We are in support of this program and hope that it will help to build on what we have already created and follow. As Onkwehonwe (native) we have always been instructed to grow our own food for the nourishment and health of our body, mind and soul.

This proposal is absolutely necessary for our youth and families of Akwesasne. Students need the opportunity to learn where their food comes from as well as the work that goes into growing the foods. There is a plethora of knowledge to be shared which covers all subject areas such as science, health, math, social studies and cultural practises. This curriculum will be taught in English and Kanien'keha (Mohawk) which will strengthen language revitalization efforts for the immersion schools and create much needed curriculum. Immersion teachers are often creating their own curriculum for their classes because it is not written in the language needed. This will help alleviate the extra work that these teachers have.

We look forward to being part of such an important project in the near future.

Niawenhko:wa (thank you very much),

Kanerahtens Tara Skidders

Kanerahtens Tara Skidders

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EXTRAORDINARY

YELLOWKNIFE

SMART CITIES PROPOSAL

Infrastructure Canada's Smart Cities Challenge



FINAL PROPOSAL

MARCH 5, 2019

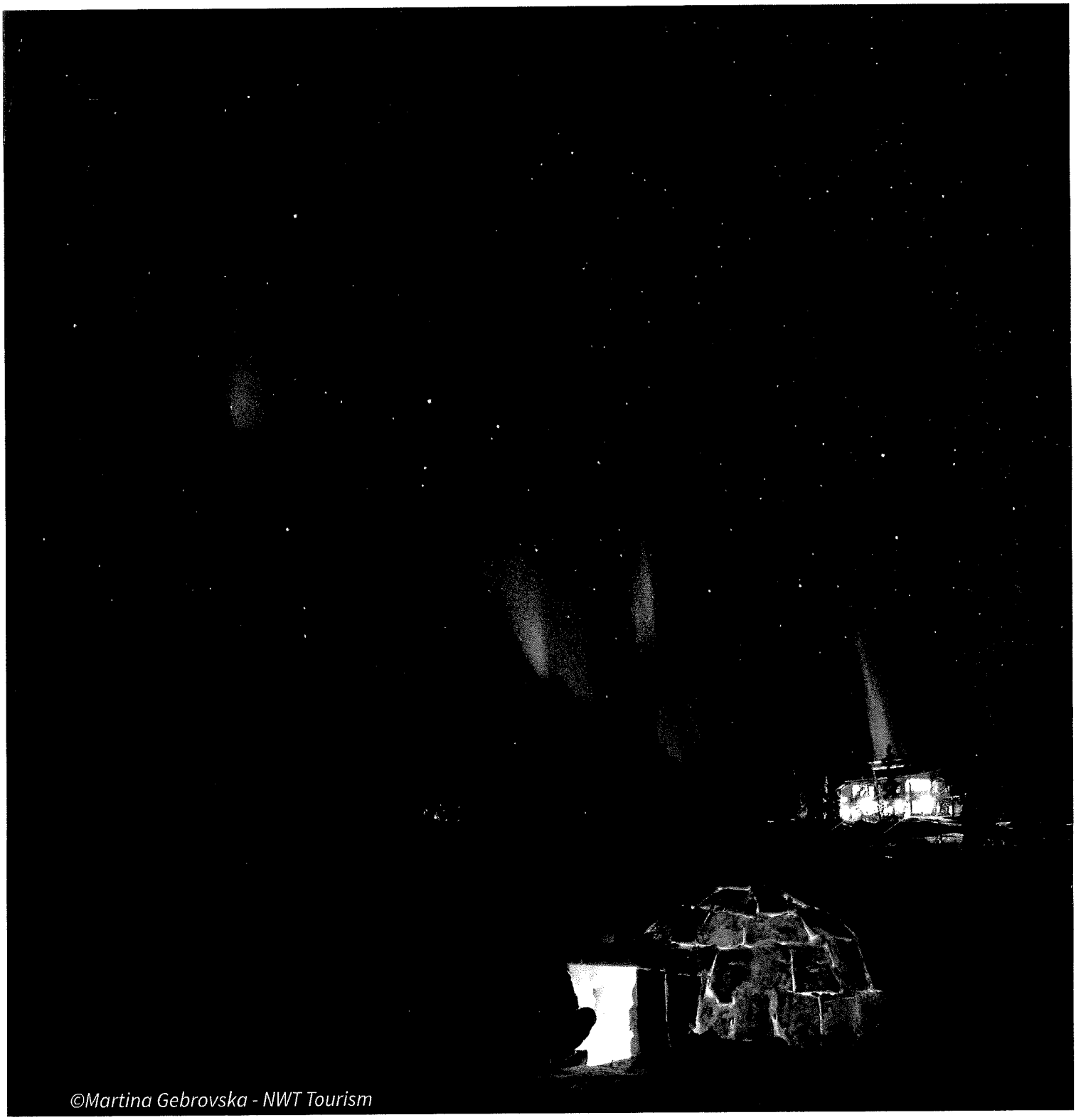
CITY OF YELLOWKNIFE

ECOLOGY NORTH

white

Northland Utilities
An ATCO and NI Company

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EXECUTIVE SUMMARY

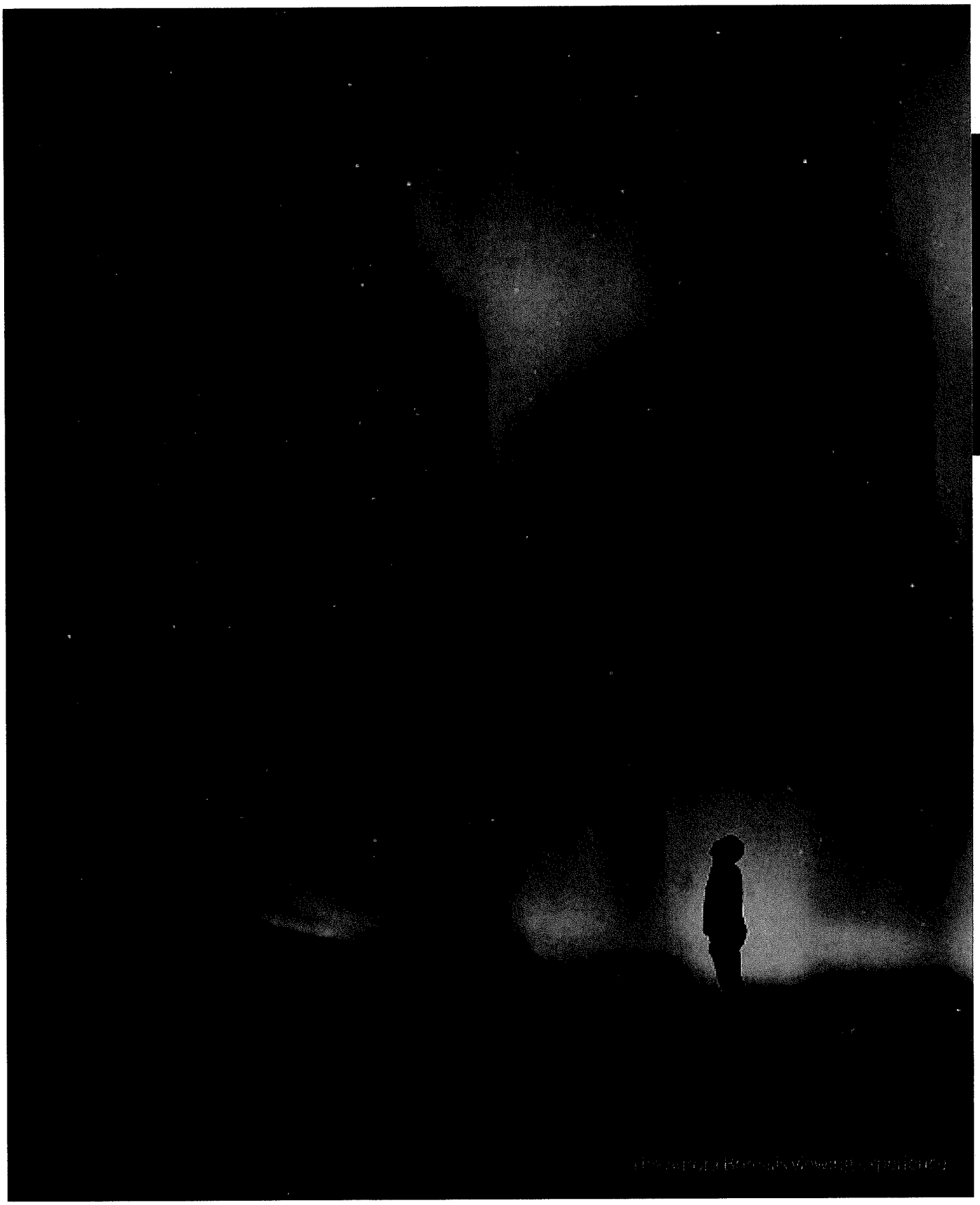
Yellowknife is a place where ambition and ideas can easily turn into reality. It is a small, tightly knit, vibrant community with strong leadership and a desire to foster innovation. The Smart Cities Challenge has engaged the City to envision a future where technology is a key part of everyday life and the design and control of that technology is controlled by clear policy for the benefit of all Yellowknifers.

The City of Yellowknife has done considerable community engagement to understand what a Smart City might mean in the northern context and how it will improve the lives of its residents. The focus of this proposal is on five key impacts: extraordinary skies, tourism, a replicable framework for northern innovation, community connectivity and sustainability. To achieve these impacts there are a series of outcomes that will be attained through the diverse technological innovations to be incorporated into the lampposts much like apps to a smartphone.

These technologies will all be vetted through new strategic thinking that will learn from the best of European and North American Smart City experience to help nurture a Northern Smart City ethos. By pitching Yellowknife as a cold weather lab for smart city innovation, the City will develop replicable plans, tools and ideas that can be spread throughout the north. The focus on dark skies and light pollution reduction will set the City apart in the competitive world of aurora tourism, and provide economic development opportunities and benefits for Yellowknifers. Electric vehicles, improved city services, beacon and geofencing technology and a mesh network will be some of the tools that help the City meet its ambitions of a smart outpost in the boreal forest.

This proposal outlines how the City proposes to take a measured and reasonable approach to reach the stated outcomes that will define success. The Smart Cities Challenge will be the springboard that turns the simple lamppost into a beacon for sustainability.

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CHAPTER 1

VISION

Challenge Statement

Yellowknife will experience a rise in our community's social and environmental well-being by transforming the simple lamppost into a beacon for sustainability.

The City of Yelllowknife's Smart Cities Challenge Statement is ambitious and summons stakeholders to explore the complexities of evolving into a Northern Smart City. In the past year, our efforts towards engagement and research have cemented the importance of using information and technology to better the lives of Yellowknifers. We are excited about this opportunity to use the Smart Cities Challenge as a springboard to make Yellowknife a place that defines itself differently: a place in which knowledge, information and Smart City technology become central to our identity as a cold-weather urban laboratory surrounded by the beauty and vastness of the boreal forest.

There is considerable work ahead before we achieve this ideal, but the pieces are in place, and we have confidence in our staff, our leadership, and in the passionate and engaged population of the City of Yellowknife.

BUILT ON GOLD, NURTURED BY GOVERNMENT, LIT BY TOURISM AND LOOKING TO TECHNOLOGY

Yellowknife, "where the gold is paved with streets", or Sambaa K'e "the Money Place" in the local Wilideh language, has a fascinating if relatively recent history as a city. Prominently located on the shores of Great Slave Lake, The Yellowknives Dene First Nation have traditionally occupied the region. The location was a rich fishing and hunting ground for the Dene People. The 1930s gold rush lead to the rapid influx of prospectors—complete with vehicles, floatplanes and all the latest and greatest technologies of the time. Yellowknife boomed with the development of two huge gold mines that spread along the shores. In time the city grew and developed a new downtown, became the administrative centre of the Northwest Territories (NWT), and eventually the capital city in 1967.

Growth continued in the 1970s and 80s, following the cycles of boom and bust that accompany the mining sector. The eventual decline and closure of both Con and Giant mines impaired the city's economy, until diamonds came to the rescue and led to a second mining boom in the 1990s. The Government of the Northwest Territories (GNWT) signed a devolution agreement in 2013, setting the stage for government to take a larger role in the economy. Meanwhile, the city core that grew so rapidly in the 1950s and 60s started to show its age, and social problems became more apparent. As the current diamond mines move towards the end of their lifespans, the tourism market, in particular aurora tourism, has emerged as a potential area of economic growth.

Meanwhile, treaties with indigenous governments in the Territories are being settled, or are in the process—which may bring about more opportunities for revitalization and growth led by indigenous governments. This evolution of opportunities (and challenges) isn't unique to Yellowknife alone, but forces us to look to our changing horizon for the next chance to redefine our city, carved out of the boreal forest on the shores of Great Slave Lake.

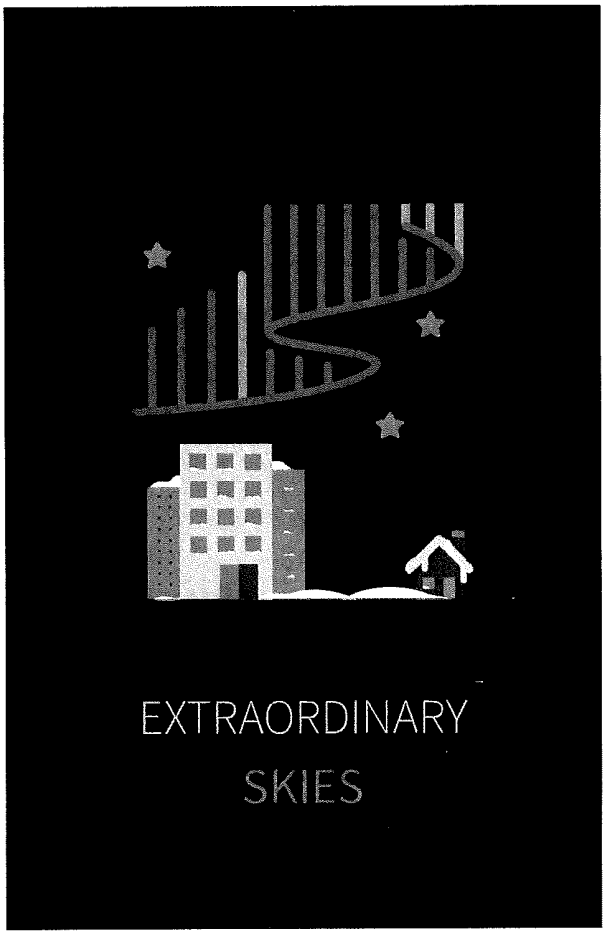
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IMPACT A:
EXTRAORDINARY SKIES

As often happens with shared resources, the night sky viewing experience has been slowly degraded. The pervasive creep of light pollution has been hastened by technology and the energy saving promise of LED lighting. We know that early adopters often learn key lessons about the adverse side effects of technology, but they also benefit longer, and are able to capitalize on future opportunities. As a leader and early adopter of a Smart City mentality, we propose to use our experience to document and outline the challenges and problems we encounter to guide others down the road of advanced technology.

We see the Smart Cities Challenge as our avenue to support other similar-sized cities around Canada, particularly the small towns scattered throughout Canada's North. By implementing a strategic lighting plan alongside interconnected lampposts, and encouraging light reductions city-wide, Yellowknife will lead by example in an area of growing importance. The next step for city lighting is to implement technology that dims and brightens lights at appropriate times. The technology is becoming available to take this city-wide and beyond.

Opening up our skyline to expose the aurora will have multiple benefits for Yellowknifers on top of the economic drivers of tourism. We will become more in tune with the sky and connected with the dancing lights. Decreasing the unnecessary presence of street lighting will allow natural lighting patterns to influence our moods and circadian rhythms without artificial influence. We intend to make the most of this opportunity to not only test the technology, but evaluate and communicate the softer benefits of improved lighting outcomes for human health, community and happiness.

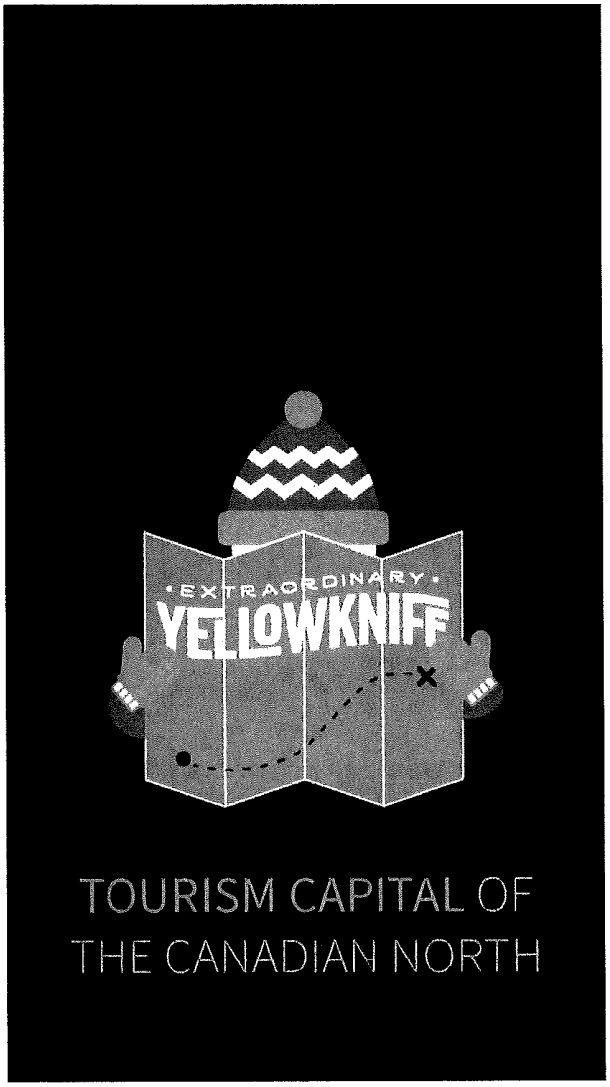


QUOTE

"The Northwest Territories has much to offer travellers – stunning landscapes, rich culture and unforgettable adventure. It also has much to gain. Tourism 2020 is an investment in our people, our communities and our future. This renewable resource has a high return on investment and will create lasting economic opportunities, careers and capacity building throughout the territory."

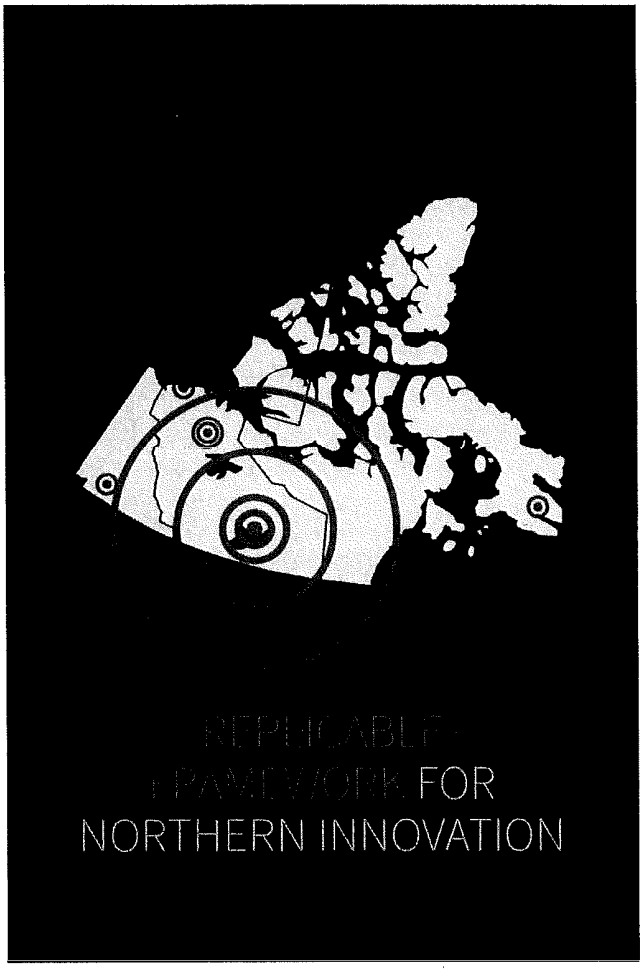
- Wally Schumann, Minister of Industry, Tourism and Investment

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IMPACT B: TOURISM CAPITAL OF THE CANADIAN NORTH

The Smart Cities Challenge will amplify existing efforts to develop our natural tourism resource of "Extraordinary Skies". In 2017-18 over 34,900 tourists travelled to Yellowknife to view the Aurora Borealis or northern lights (GNWT, 2018) . Tourism employs over 12% of NWT residents, with a spinoff effect estimated at $3.80 for every $1 spent (NWT tourism, 2016). The Government of the Northwest Territories (GNWT) expects 35% growth in the industry increasing visitor spending to $235 million by 2020 (GNWT, 2016). Yellowknife happens to be ideally situated under the auroral belt, has clear skies and is regarded by many as the best place in the world to view the northern lights.



IMPACT C: REPLICABLE FRAMEWORK FOR NORTHERN INNOVATION

Yellowknife has the potential to become a place where knowledge and technology combine to carve out a sector of the economy that is defined by our natural and cultivated assets. The city will evolve into an experimental hub of technology and a place of new, innovative enterprise.

The foremost factor encouraging this transformation is the people. Northerners are well known for their resilience, strength of character and resourcefulness, but also for their adaptability and openness to change. Yellowknifers are young and well-educated, having near the highest per capita post-secondary degrees in Canada (McGrath, 2013), and is increasingly multicultural. This unique blend of intellect, diversity, creativity, and youthful vigour, when combined with the knowledge and resilience of our First Nations partners, makes our population a perfect place to build a Smart City.

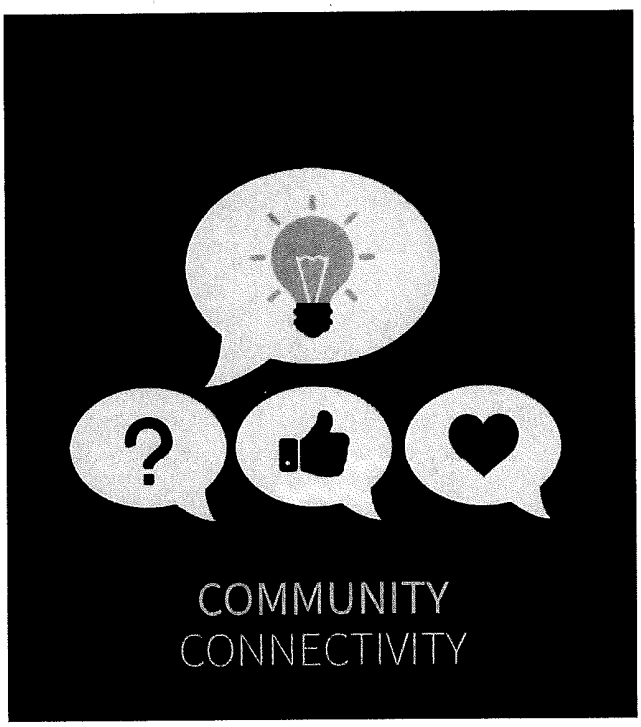
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We view this opportunity as a springboard to build a sustainable model for economic development built on tourism, research, and innovation. Yellowknife's relatively small size makes the City agile. Its location at the end of the highway, in the midst of a cold and harsh climate, makes the city an ideal laboratory for innovation, cold-weather testing and information technology. We see a future pitch from our new smart-city-endorsed label: "tested in Yellowknife".

The final factor is our politics. We are home to a strong base of democratic idealism, a consensus government that isn't subject to partisanship, and a flair for pushing the envelope. A strong civil society is another feather in our cap, and being a small jurisdiction, our partnerships and engagement are based on human relationships—like the comfort that comes from meeting your elected officials in the grocery store checkout line. The key to our continued evolution into a smart city will be engagement with the population, and particularly our First Nations partners and neighbours. We will develop a new story for a diverse and prosperous Yellowknife centered around technology, innovation and resilience.

IMPACT D: COMMUNITY CONNECTIVITY

Our research has shown that having a clear framework for technology adoption and decision-making is key to making a Smart City. Establishing policies, targets, and strategies into a Smart Cities framework will make the ground rules clear, structure our decisions on technology, and evaluate and measure success. In cities like Barcelona, Glasgow and Copenhagen, these frameworks are already well-advanced; these European case studies can serve as models for our own Smart City Vision. White Arkitekter, the largest architecture firm in Scandinavia and a global leader in sustainability, have been a key stakeholder since the beginning to bring European best practices and experience straight to the Canadian North. Carleton University's Urban Research Lab has helped to understand the North American ex-



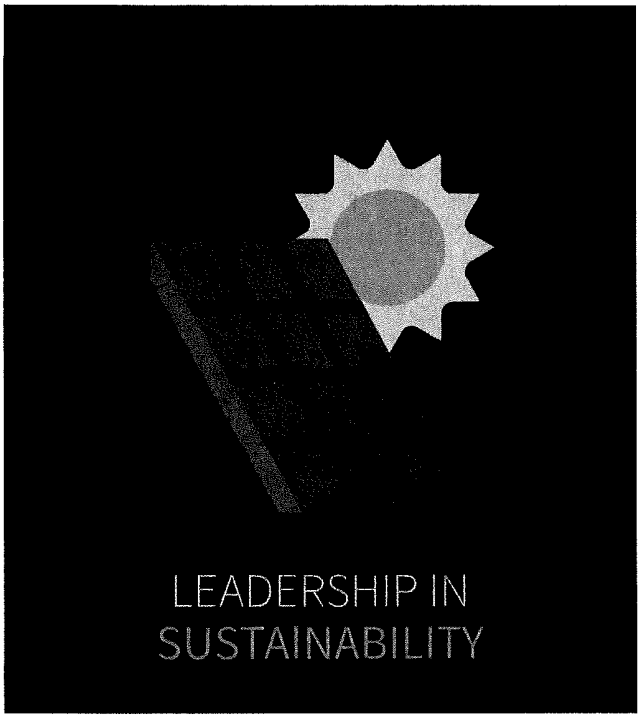
perience with Smart Cities and urban context, while our very own local environmental champion Ecology North has helped the City bring these pieces together in a coherent manner.

Venturing into the realm of Smart Cities is unchartered territory for the stakeholders. We look forward to an iterative process that includes the necessary checkpoints and protocols to ensure that the project moves forward in a meaningful and manageable manner. Already, the Smart Cities process has sown seeds across city departments on how to improve municipal servics through integrated technology.

One of the key components of our journey will be to develop an Information Technologies Smart Cities Strategic Plan: which will guide our outlook on Information Technology, and create a framework for making decisions around information moving forward. This framework will be based on the experiences of those who have gone before us, but be scaled and adapted to our unique Northern circumstances.

A key part of our transformation will be continuous engagement with Yellowknife citizens. Open data sharing and knowledge transfer will also help the City gain social licence and trust, build partnerships, and leverage funding and ideas. Using the ubiquitous lamppost as a beacon for sustainability, we will create distinct and unique opportunities for citizen and stakeholder engagement within a Smart Cities construct.

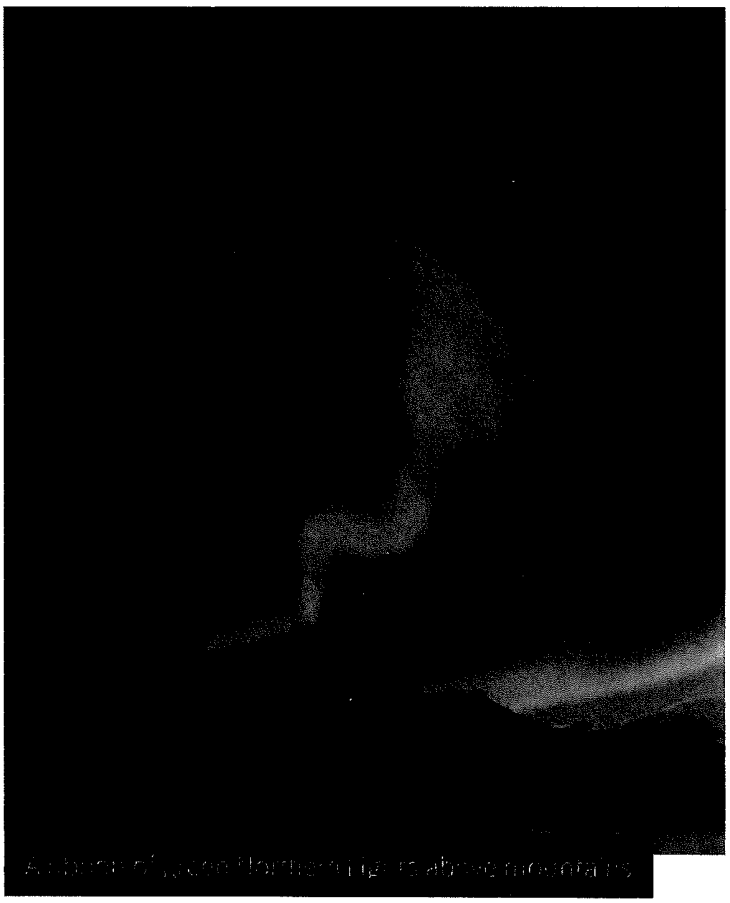
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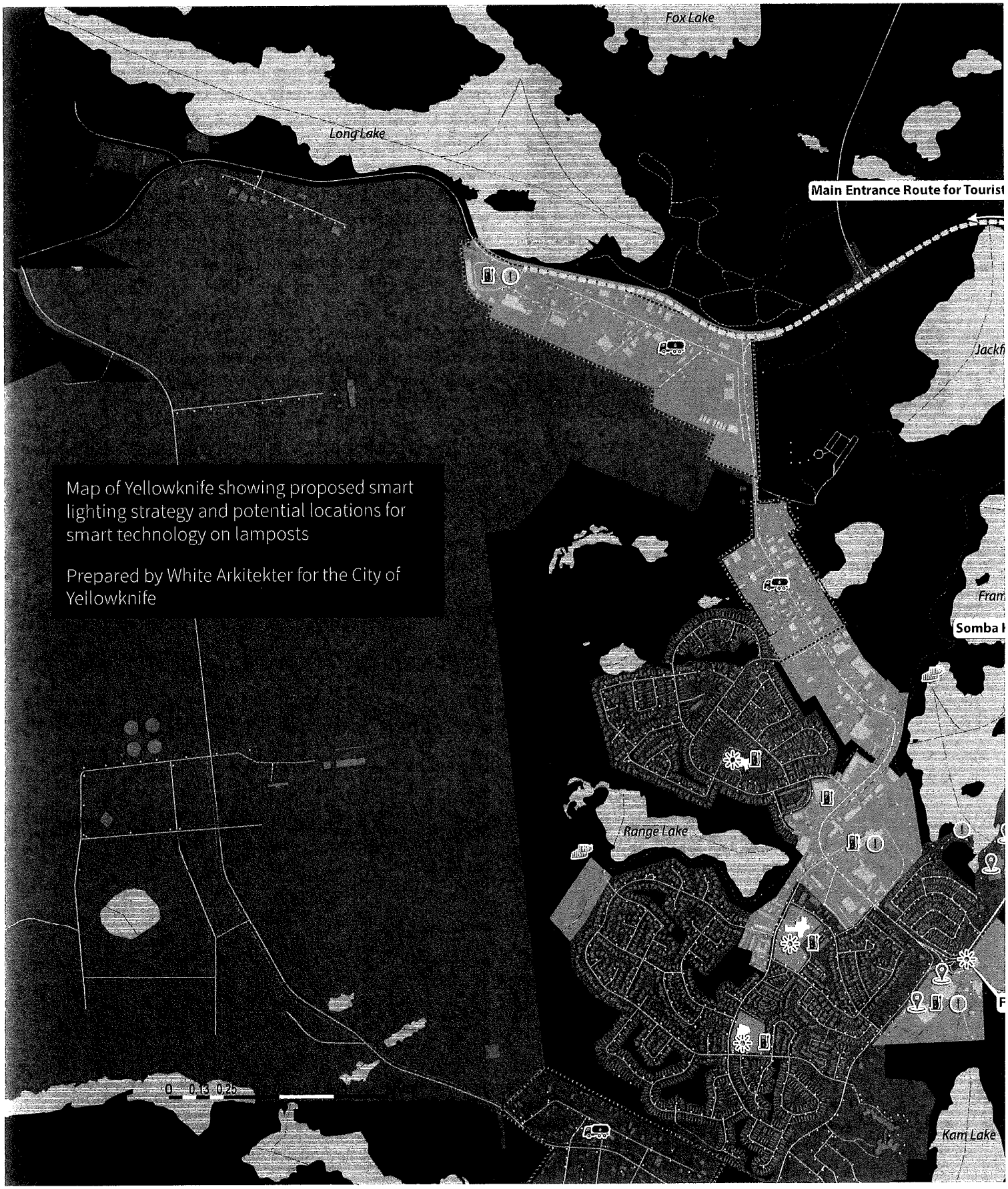
IMPACT E: LEADERSHIP IN SUSTAINABILITY

Meanwhile Yellowknifers and tourists will benefit from the adaptation of the lamppost to pose innovative solutions, as suggested by the city's residents. Electric Vehicle (EV) charging stations built right into streetside lampposts will help to encourage adoption of electric vehicles, and prove that they work in the north. Lamppost-based geofencing and beacon technology will help make interpretive materials, event schedules, maps and community knowledge available to tourists, directly through their smart phones and in their mother tongue. Expanded free Wi-Fi would help tourists and locals to connect with services, information, maps and social media. Meanwhile, the majority of city lampposts would be connected to a series of 22 gateways that will move internet protocol (IP) information back to City Hall, and underpin a mesh network and new information hub at City Hall. This network will enable the installation of sensors that can reduce costs for City and other services: such as water and sewer infrastructure, waste, transportation, and data collection on permafrost, climate, and the environment. These improvements in services will help reduce energy and electricity costs and greenhouse gas emissions, improving our already impressive track record of climate leadership and citizenship to promote buy-in and engagement. To this aim we will cultivate transparency, collaboration, replicability and rapid prototyping in our process of becoming a Smart City.

Yellowknife's northern setting creates unique circumstances around infrastructure, resources, and culture. The implementation of a connected network via the lamppost feature in this remote, climatically-harsh location will pave the way for other northern communities on a regional or national scale. Our frameworks and technologies will be replicable and adaptable to other northern contexts. Yellowknife is well-poised to act as a leader and a laboratory for innovative practices. As we move forward in transforming our City, we look to our citizens to embrace the smart tools and networks that will improve the lives of Yellowknifers. The Smart Cities Challenge is an opportunity to build a sustainable model for economic development based on tourism, technology and the potential for Yellowknife to act as an open-air cold weather lab.



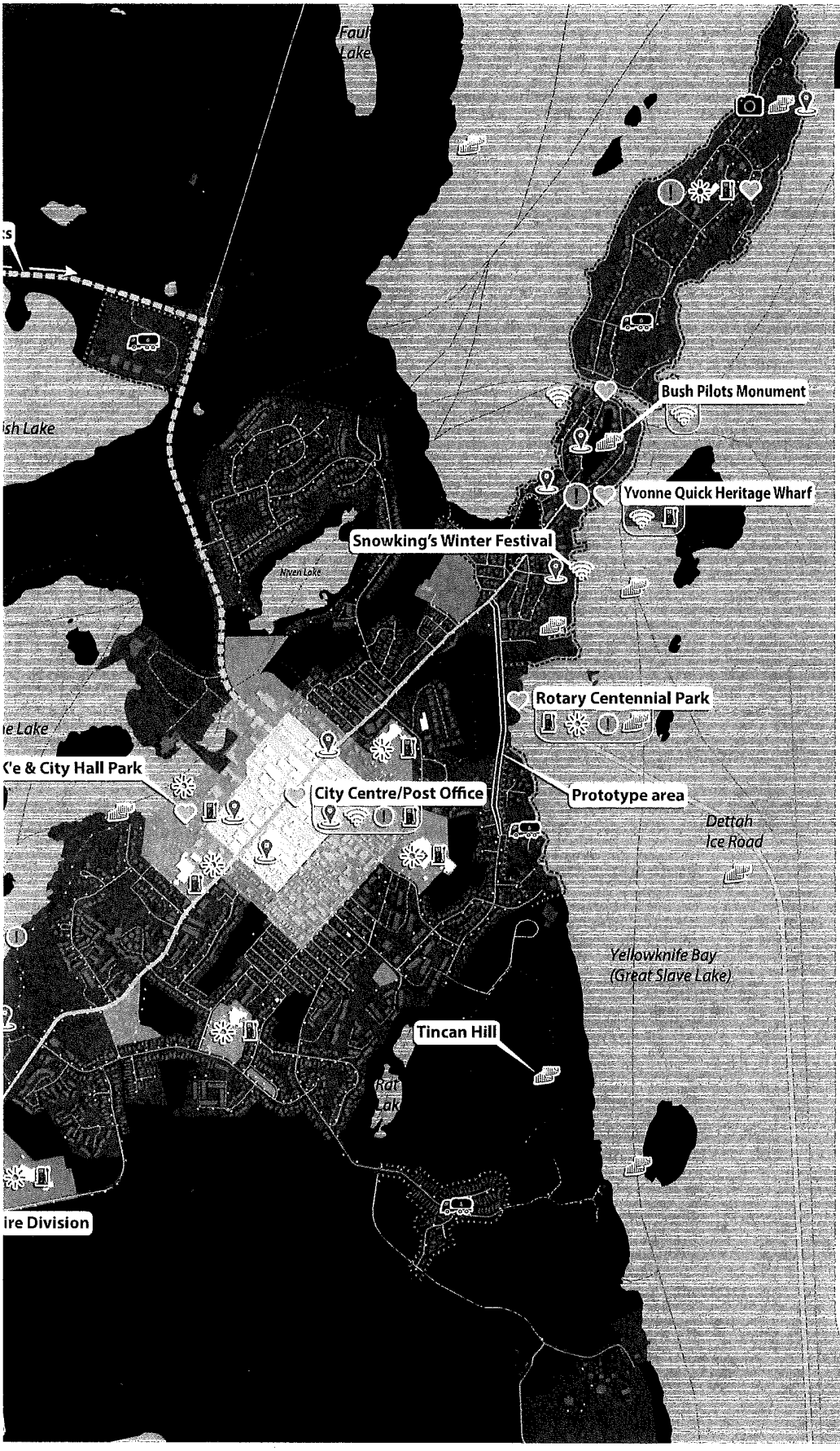
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Map of Yellowknife showing proposed smart lighting strategy and potential locations for smart technology on lamposts

Prepared by White Arkitekter for the City of Yellowknife

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EXTRAORDINARY YELLOWKNIFE STRATEGY MAP

BEACON OF SUSTAINABILITY

At these points of interest the light poles can be given a more striking visual dimension, clearly stating their importance and contribution to Yellowknife's work towards a more sustainable society.

AURORA VIEWING SPOTS

Potential Smart Tech Integrated with Light pole

MUNICIPAL WIRELESS

PANIC BUTTON

GEOFENCING & BEACON AREA

AURORA SELFIE CAMERA

LIGHT SIGNALS

Warns for thin ice along shores or speed limits when in proximity to schools. Close to the fire division they can also signal in case of emergency.

EV-CHARGING STATION

TRUCKED WATER AREA

PRIMARY ROAD

PROTOTYPE AREA

Motion dimmable light

Lighting Priority Zones

LPZ0 - HIGH
Wilderness areas, parks and preserves, and undeveloped rural areas. Includes protected wildlife areas and corridors.

PZ1 - MEDIUM
Wilderness areas, parks and preserves, and undeveloped rural areas. Includes protected wildlife areas and corridors.

LPZ2 - LOW
Light commercial business and industrial districts, high density or mixed used residential districts.

LPZ3 - LOWEST
Large cities' business district, commercial corridors, town centers heavy in dustrial zones.

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CHAPTER 2

PERFORMANCE MEASUREMENT



OUTCOMES

A.1 Increase in Dark-Sky Friendly Neighbourhood trends

A.2 Decrease in sky glow (light pollution) based on 2019 levels

A.3 Increase in public awareness about effects of light pollution

OUTCOMES

B.1 Increase in tourism

B.2 Increase in quality of Aurora Borealis viewing experiences

B.3 Increase in location-tagging and tourism hashtags

B.4 Increase in use of Ping Street app

B.5 Sustainable economic diversification and income to local tourism-based businesses

OUTCOMES

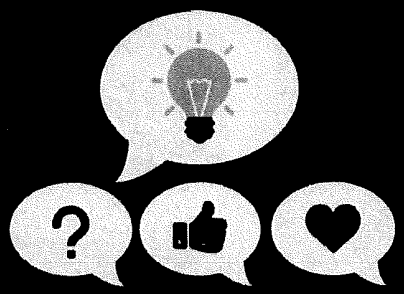
C.1 Finalized, scalable and shareable IT strategy for northern municipalities

C.2 Outputs consistent with Smart City Vision at 3 & 5 year Checkpoints

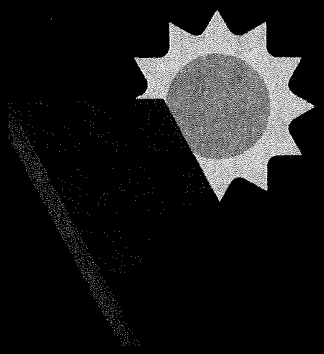
C.3 Participation by external contractors in developing applications for Yellowknife IoT infrastructure

C.4 Reduction in cost and increase in reach of municipal services

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COMMUNITY CONNECTIVITY



LEADERSHIP IN SUSTAINABILITY

OUTCOMES

D.1 Increase in local expertise and literacy regarding smart cities technology

D.2 Increase in engagement on Placespeak

D.3 Increase in real-time information being updated in the Pingstreet App

D.4 Increase in broadcasting impact and reach

OUTCOMES

E.1 Yellowknife will lead the North in Electric Vehicle penetration

E.2 Make progress toward the targets set in Yellowknife's Corporate and Community Energy Plan

E.3 Reduction in electricity use from dimmable streetlights

E.4 Reduction in water and energy use and carbon emissions from improved city services

E.5 Progress toward achieving United Nations Sustainable Development Goals



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CHAPTER 2

PERFORMANCE MEASUREMENT

INPUTS

resources. time. capital.

ACTIVITIES

on-the-ground. planning.

application phase

open house 60 visitors

3-day design charrette
- 40 participants
- 19 prototype suggestions

R&D, strategic planning
- ~20 group meetings
- ~60 informal meetings

advocacy
- pitch to City Admin
- pitch to City Council
- proposal writing
- public open house
- feedback integration

finalist phase

$250k

"Dark Skies" public event
- Infrastructure Canada participation

prototype installation
- launch events
- public engagement web platform development

prototype monitoring
- effectiveness
- public response

strategic forecast
- results analysis
- financial forecasting
- drafting work plan

feasibility study
- selection of prototypes: adaptive lighting; EV charging; geofencing; WiFi; utilities monitoring

initial prototyping phase
- design ▸ procurement ▸ shipping ▸ installation
- monitoring & reporting

Smart City Prizewinner Phase

$5M

development of strategic frameworks
- baseline development for all strategies
- best practices framework for City IT infrastructure
- Extraordinary Yellowknife Lighting Strategy

implementation
- engagement with utilities contractors
- selection of vendors & contractors
- design ▸ procurement ▸ hardware installation

operations & maintenance
- update training & resources for employees
- continuous feedback & improvement

monitoring & reporting
- engagement & feedback
- baseline determination, consumption & usage tracking

communications & engagement

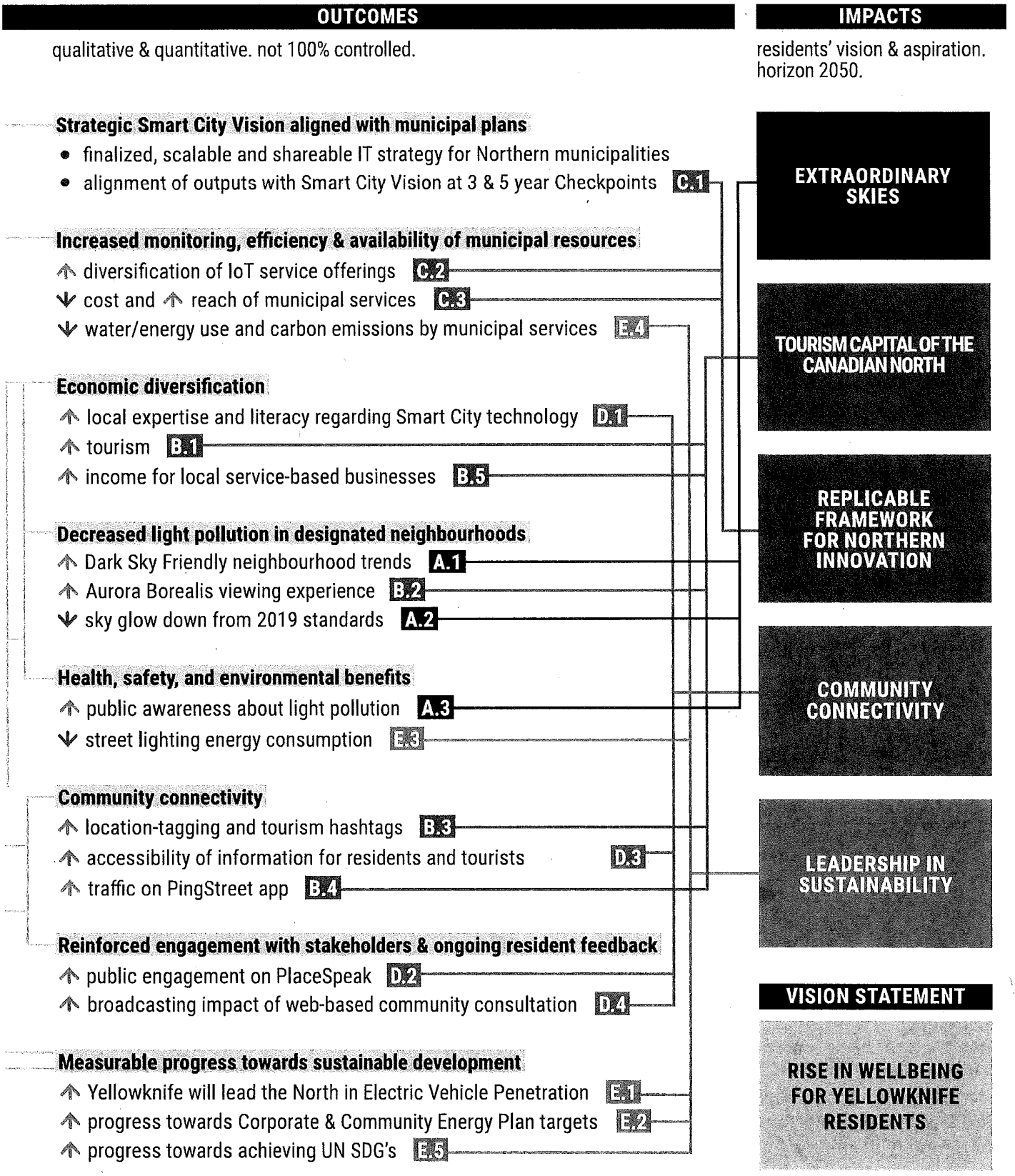
OUTPUTS

deliverables.

- **OPEN SOURCE FRAMEWORKS**
- **CITY-WIDE MESH NETWORK**
- **DATA INTERACTION SENSORS**
- **LIGHT POLLUTION REDUCTION TECH**
- **GEOFENCING & BEACON TECH**
- **MUNICIPAL WIRELESS**
- **ELECTRIC VEHICLE CHARGING STATIONS**

higher control

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CHAPTER 2

PERFORMANCE MEASUREMENT

Measuring success against quantitative and qualitative performance indicators is a key part of Yellowknife's Smart City Plan as highlighted in this proposal. The chart on the previous page summarizes this proposal in five columns that help explain the journey to become a Smart City. The **inputs** tell the story, while **activities** summarize the proposed plan, and the final column, **Impacts**, summarizes the vision. The **outputs** column highlights the deliverables and technologies, while the **outcomes** are the key to performance management. Striving to achieve the impacts and fulfill the vision will be an iterative journey. This journey will recognize a considerable number of actionable variables that must be addressed in order to reach the measurable outcomes.

MEASURING PERFORMANCE

To build consensus, understanding and consistency around a Smart Cities framework, Yellowknife will consider following the International Organization for Standardization Certification ISO 37106:2018 for Sustainable Cities and Communities. This document gives guidance for leaders in cities and communities on how to develop an open, collaborative, citizen-centric and digitally-enabled operating model for their city that puts the vision for a sustainable future into operation (ISO, 2018).

As the basis for a new Smart City Yellowknife vision, the ISO standard will enable processes for the innovative use of technology and data. It will ensure that the City is working within a consistent and globally accepted framework for sustainable cities. Further to this the City will initiate a series of strategies and action plans that will provide a framework to reach the stated impacts. This chapter will highlight the five impact streams that the City has identified to help reach the vision, the outputs which are the plans to get there, and the outcomes that will allow for performance measurement.

IMPACT STREAM A: EXTRAORDINARY SKIES

Yellowknife will maintain its reputation as the the most attractive aurora borealis tourism destination in Canada by focusing on the reduction of light pollution using dark sky principles and a city-wide Lighting Strategy. Putting in place the conditions necessary to achieve Extraordinary Skies starts with a progressive transition to embracing Extraordinary Yellowknife (output A.2). The municipality will slowly phase out lights that are not compliant with the concept of Dark Sky municipalities. Most of the long-term impacts are outside the timeframe of this Smart Cities Challenge, and should be visible over the course of the next 10 years. However, it is anticipated that the implementation of new lighting will have an immediate, noticeable impact on light pollution.

Output A.1 Light pollution baseline in Yellowknife

Output A.2 Development of "Extraordinary Yellowknife" Lighting Strategy to guide municipal retrofit lighting plan

Output A.3 Best practices guide for dark skies compliance

Output A.4 Transitioning of select Yellowknife streetlights to smart lighting technology, in alignment with the Lighting Strategy

Output A.5 Retrofitting of select Yellowknife neighbourhoods into Dark Sky compliant areas

The determination of the current light pollution baseline (output A.1) will show the potential for what is yet to come. Using the latest technology, the Yellowknife Smart Cities Challenge team will measure the current light pollution levels in the City. It has not been decided yet what tool will be used, nor if the light pollution illuminance in the covered or starry sky will be measured. Additional

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work is underway to determine the best technique that will not provide erroneous results because of changing weather conditions.

The City will evaluate the effectiveness of the motion sensing dimmable light pilot project on School Draw Avenue with regard to energy savings, functionality, safety, security, light pollution reduction and citizen approval. The City and partners will identify appropriate improvements and a plan to expand to lighting retrofits and city wide lighting improvements strategically (output A.4).

As part of a city-wide expansion of dark sky compliance, the City will continue to work toward reductions of unnecessary lighting and improving awareness about the effects of light pollution. This output will be no additional cost for Yellowknife residents as it does not force an immediate retrofit, but rather a long-term change in mentalities. Local retailers will be moving towards Dark Sky friendly lighting fixtures. There is no requirement, but built in incentives and awareness of benefits to encourage homeowners and businesses to change the existing non-compliant lighting fixtures.

Outcome A.1 Increase in Dark-Sky Friendly Neighbourhood trends

Outcome A.2 Decrease in sky glow (light pollution) based on 2019 levels

Outcome A.3 Increase in public awareness about impacts of light pollution

As the centerpiece of Yellowknife's Smart Cities experience, the City will experience a reduction in light pollution, better aurora viewing outcomes and a closer connection with our extraordinary skies. Learning from the pilot project on School Draw Avenue will assist the City as it expects to expand dimmable lighting throughout half of the city within five years. All of this will be done with guidance from the Yellowknife Lighting Strategy once approved by Council. A strategy will also be set for how to start a public awareness campaign to educate and encourage residents and businesses to reduce private lighting and to encourage dark sky compliant fixtures. Efforts will also be made toward strengthening partnerships in order to understand and study the impacts of LED lighting on human health and wildlife.

As motion sensing dimmable lighting is a relatively recent technology there are risks for early adoption. The City intends to work closely with industry and partners to ensure lessons are learned from the pilot project, and that residents understand and are excited about the prospects of dimmable lighting. The biggest risk factor is the potential for perceived safety risks to negatively impact the public appetite for dimmable lights. To mitigate this risk the City will research and communicate the safety and health benefits of motion-sensing dimmable lighting to the people of Yellowknife.

IMPACT STREAM B: TOURISM CAPITAL OF THE CANADIAN NORTH

Yellowknife is happy to be a market leader as a northern tourist hotspot. To maintain and improve this status will require considerable effort in many areas, including efforts to use technology to improve the experience of tourists. This will be done by using smart lighting to better showcase our extraordinary skies (output B.1). Improving tourism products and services while catering to a new brand of Smart City tourism that has the potential to create sustainable economic diversification and provide income to local tourism-based businesses.

Output B.1 Promotion of Extraordinary Skies for tourism (in parallel with outputs A.2 to A.5)

Output B.2 Work with partners to increase availability of resources and information to tourists, using both digital and traditional platforms

Output B.3 Expansion of geofencing infrastructure

Output B.4 Development and installation of beacon technology

Output B.5 Expansion of existing free municipal wireless network

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Outcome B.1 Increase in tourism

Outcome B.2 Increase in quality of Aurora Borealis viewing experiences

Outcome B.3 Increase in location-tagging and tourism hashtags

Outcome B.4 Increase in use of PingStreet app

Outcome B.5 Sustainable economic diversification and income to local tourism businesses

Taking pride in our Extraordinary skies and improving night sky viewing opportunities for tourists will be a key part of the Smart Cities plan. This will be easily tracked by economic indicators that the Government of NWT compiles around tourism, and also adoption and use of apps, social media and beacon technology. But the full story of how a Smart City focus improves the tourism experience will be found in qualitative experience of the tourists itself. To that end the City will continue to work with partners at NWT tourism, the future Yellowknife destination marketing board, and tourism industry providers.

There are global and national issues that pose a risk to tourism in Yellowknife. These are beyond the control of the City, but by improving the experience of tourist through tourism and a Smart City experience that risk will be substantially mitigated.

IMPACT STREAM C: REPLICABLE FRAMEWORK FOR NORTHERN INNOVATION

Developing a clear strategy for making Yellowknife a smart city, as well as an open transparent cold-weather laboratory for smart cities technology, are both key aspects of this plan. Being the hub for the North, Yellowknife also wants to document and communicate successes and failures to help other similar-sized northern communities adopt smart practices, policies and technology that make sense in our harsh climate. The City intends to do this through the following five outputs, measurable by the subsequent outcomes.

Output C.1 Adoption of ISO 37101:2016 Sustainable Cities and Communities

Output C.2 Commissioning of Smart Cities IT strategy and action plan

Output C.3 Creation of Smart City Committee to oversee the integration of Smart Cities vision into municipal services and infrastructure

Output C.4 Expansion of municipally-owned Internet of Things (IoT) infrastructure

Output C.5 Improvement of City Information Hub, backhaul infrastructure and lamppost mesh network.

Output C.6 Development of Engagement Plan, including incentivization plan and protocol for third party participation

Output C.7 Creation of research budget to incentivize entrepreneurial Smart Cities innovation in a northern setting

Outcome C.1 Finalized, scalable and shareable IT strategy for northern municipalities

Outcome C.2 Technology-related outputs consistent with Smart City Vision at 3 & 5 year Checkpoints

Outcome C.3 Measurable improvement in developing applications for Yellowknife IoT infrastructure

Outcome C.4 Reduction in cost and increase in efficiency of municipal services

Key outcomes will be achieved following the development of strategic plans, and the subsequent improvement of the IT strategy and system. This will help turn Yellowknife into a centre where IT and information generated by smart data become key factors in municipal strategic planning, and smart technology solutions are increasingly adopted by the public, society groups, and the private sector.

Incorporating project "checkpoints" at the end of years 3 and 5 is a strategy for course correction that mitigates the risk of misaligning outputs with outcomes. Oversight of the three- and five-year checkpoints will fall under the purview of the Smart Cities Committee. This committee will pro-

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vide oversight for the assessment and implementation of the IT Strategy in alignment with the Smart CIty vision and is described in more detail in chapters 3 and 5 of this proposal.

An anticipated risk for Yellowknife is that investors and the private sector will not see the financial benefit of participating in a small market pool. To mitigate this risk, the Incentivization Plan (output C.5) will work with targeted companies and stakeholder groups within the city to design the tools that build the Smart City. A variety of engagement tools will be used: mini challenges, university engagement, rewards and targeted workshops. This Incentivization Plan will be a key element to promote smart cities and encourage engagement.

The backbone technology for the implementation of a Smart City that is replicable across the north will be unleashing the potential of the internet of things (IoT) in Yellowknife, and collecting, organizing and communicating the information in a form that improves the well-being of Yellowknifers (output C.4). This will enable a plethora



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of sensors to be incorporated into the system using the lamppost as a platform. The number of sensors will be a key outcome. We cannot predict which ones will be included and when but some we have identified as promising include: water and sewer tank sensors, leak detection, parking occupancy, snow level, carbon dioxide, distance measurements, trash bin levels, potable water tank level, wastewater tank levels, manhole open/close detection, light sensor, pedestrian, automobile and bike traffic, ice thickness, wildlife activity, water quality, water contaminants, smart valves, and more.

IMPACT STREAM D: COMMUNITY CONNECTIVITY

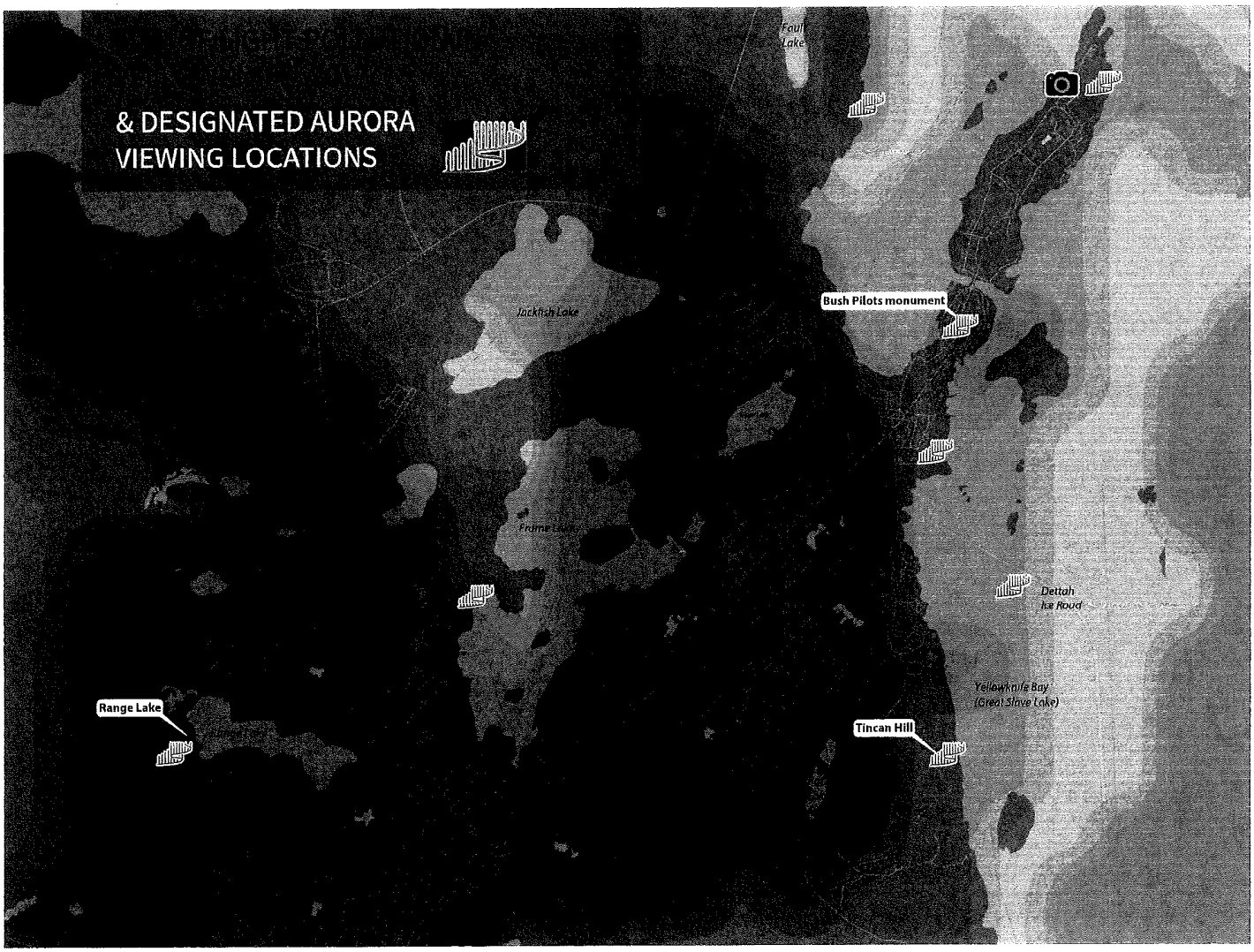
Output D.1 Governance structure in place to oversee the development of a Communications Plan and budget

Output D.2 Annual Engagement Plan to build awareness excitement and engagement in Smart City Evolution

Output D.3 Development of Yellowknife Smart City Dashboard to accompany PingStreet App

Output D.4 Installation of WiFi hotspots throughout the City for free internet services

Output D.5 Implementation of training strategy for municipal employees and contractors to build local labour capacity in smart city technology



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The City of Yellowknife has made great strides towards accountability and engagement with residents. In 2015 Yellowknife launched the Pingstreet app; a one-stop mobile application for the City of Yellowknife services. It currently has over 1,300 unique users in Yellowknife and has proven to be an effective tool for fostering an active and informed community. This application is a free, widely available location-based tool that gives users access to information on various city services like parking and transit. In addition, the City has a tool called PlaceSpeak which is a medium for two-way communication between the City of Yellowknife and its residents. This communication and engagement tool was introduced in April 2016 and has since accumulated 1,284 connected participants, 211 comments, and 17 completed surveys across 14 different community consultation projects. The municipal mapping tool City Explorer communicates information spatially in many layers. These tools form the basis for engaging with Yellowknifers digitally and will be incorporated into a strategic plan for Smart City Engagement, which will become part of the Smart City journey.

The Engagement Strategy and Communication Plan (outcome D.1) will help to build awareness and approval among Yellowknife residents about what a Smart City is. It will also assist in addressing any risks or concerns perceived by the public in order to increase local support for a Smarter Yellowknife. Engagement will be increased by a dedicated budget to improve the engagement tools and communication that residents use to access city services, and by maintaining a clear focus on transparency and openness. The Smart City Dashboard and PingStreet app will be the main points of access to municipal services and information and will facilitate residents' interactions with the city.

The City will assess its Engagement Strategy at the end of years three and five of this project's timeline. This will allow the municipality to keep track of its progress, and reorient efforts towards the most critical problems. These assessments serve as built-in checkpoints for course correction and risk mitigation.

Outcome D.1 Increase in local expertise and literacy regarding Smart Cities technology

Outcome D.2 Increase in engagement on Placespeak and City Dashboard

Outcome D.3 Increase in real-time information being updated in City communications

Outcome D.4 Increase in impact, awareness and reach of technology and Smart Cities

Having a connected and engaged population is key to truly embracing the Smart Cities Vision. This is not easy to do with the competing flood of information and media, but cities are becoming more central to the lives of citizens as information and service provision becomes more centralized online. To accomplish the outcome of a more engaged population, the City will develop a strategy and communication plan, improve and coordinate its existing tools, and develop a new tool, as well as engaging stakeholder groups more effectively.

Continually incorporating stakeholder and resident feedback in planning and activities will mitigate risk surrounding public perception and participation. Following the standard set by ISO 37106:2018 and adhering to oversight by stakeholder committees will ensure openness and transparency in communications.

IMPACT STREAM E: LEADERSHIP IN SUSTAINABILITY

With a track record of sustainability, the City of Yellowknife is no stranger to being a northern leader in green innovation. In 2012 the City attained all five corporate and community milestones in the Local Governments for Sustainability and Federation of Canadian Municipalities (FCM) Partners for Climate Protection program. Since then, the City has also been awarded:

- 2011: FCM Sustainable Communities Award for the Smart Growth Development Plan.
- 2013: Green Champion Award and the Sustainable Communities Award for the centralized composting pilot project

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- 2018: FCM Sustainable Communities Award for Energy for district biomass energy system (saving 829 tonnes of CO_2e/year)

The continued effort toward sustainability by the City of Yellowknife is demonstrated in the 2015 to 2025 Corporate and Community Energy Action Plan. Building on the 2006 Energy Plan, this new rendition sets a target for a fifty percent reduction in greenhouse gases by the City Corporation and thirty percent reduction by residents and businesses.

Output E.1 The creation of an incentivization plan for electric vehicle penetration in Yellowknife

Output E.2 Continued improvement of partnerships with key stakeholders

Output E.3 Installation of municipal EV charging stations

Output E.4 Promotion of GHG emission reductions through incentivization of Smart Cities technologies

Output E.5 Assessment of and reporting on progress towards achievement of the UN Sustainable Development Goals.

A Smart City framework will help the City take one more step forward to achieving this ambitious plan. The framework includes best practices, better engagement tools, and harnessing the power of information and technology to reduce energy use and greenhouse gases. Possibilities for improvements include lighting retrofits, electric vehicle encouragement, sensors that reduce costs incurred by the city, energy costs and greenhouse gases, and even incorporating new biomass heating technologies. In order to direct this project's strategy around sustainable action, The United Nations Sustainable Development Goals were selected as overarching key performance indicators. These were selected during the 2-day Community Design Charrette retreat, and through a selection process led by residents and stakeholders were narrowed down to goals that were applicable to the Yellowknife context. In short, 4 goals and 9 targets were chosen the most critical for immediate action in Yellowknife.

See Chapter 6 *Multi-stakeholders 2-day Design Retreat* for the detailed story.

Outcome E.1 Yellowknife will lead the North in Electric Vehicle penetration per capita

Outcome E.2 Measurable pogress toward the targets set in Yellowknife's Corporate and Community Energy Plan

Outcome E.3 Reduction in electricity use from dimmable streetlights

Outcome E.4 Reduction in water and energy use and carbon emissions from improved city services

Outcome E.5 Progress toward achieving the United Nations Sustainable Development Goals as detailed in the Phase 1 Design Charrette Report

As a true leader in sustainability, the City sees this opportunity as a way to improve its credentials, and use information and the Smart Cities framework as a methodology for more efficient use of internal resources, better services to its citizens, and a reduction in greenhouse gases and energy use.

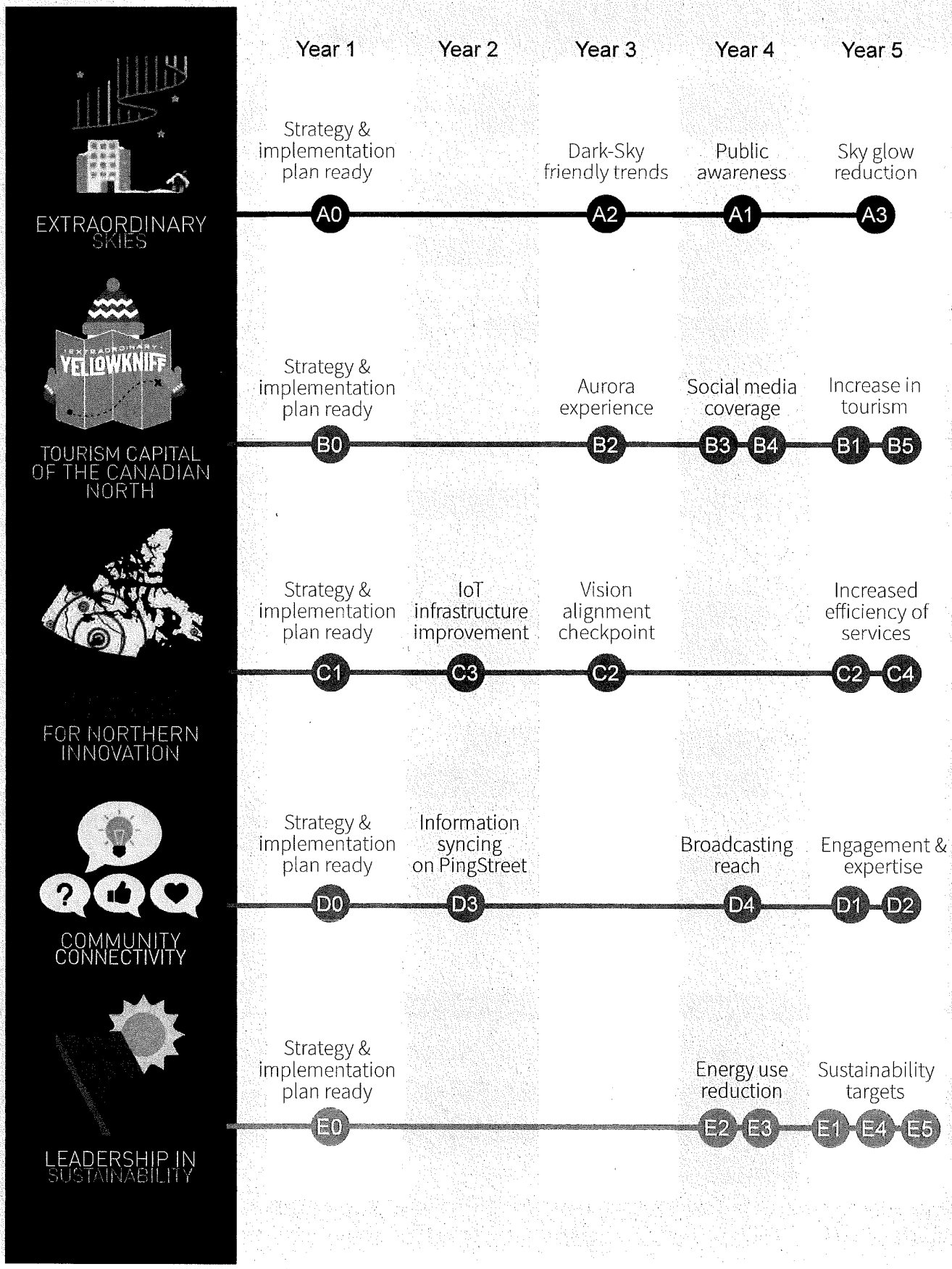
Being more sustainable is clearly a goal that all cities should aspire to. Above what the City is already doing, the Smart Cities approach should help to harness the power of information and technology to further the impact that the City can make.

PAYMENT TIMELINE

Since the Yellowknife SCC project is predicated on the development of coordinated strategies and implementation plans and a myriad of possibilities, it was a challenge to clearly identify outcomes. The following payment timeline will highlight broadly the anticipated timing of key outcomes which will trigger payment.

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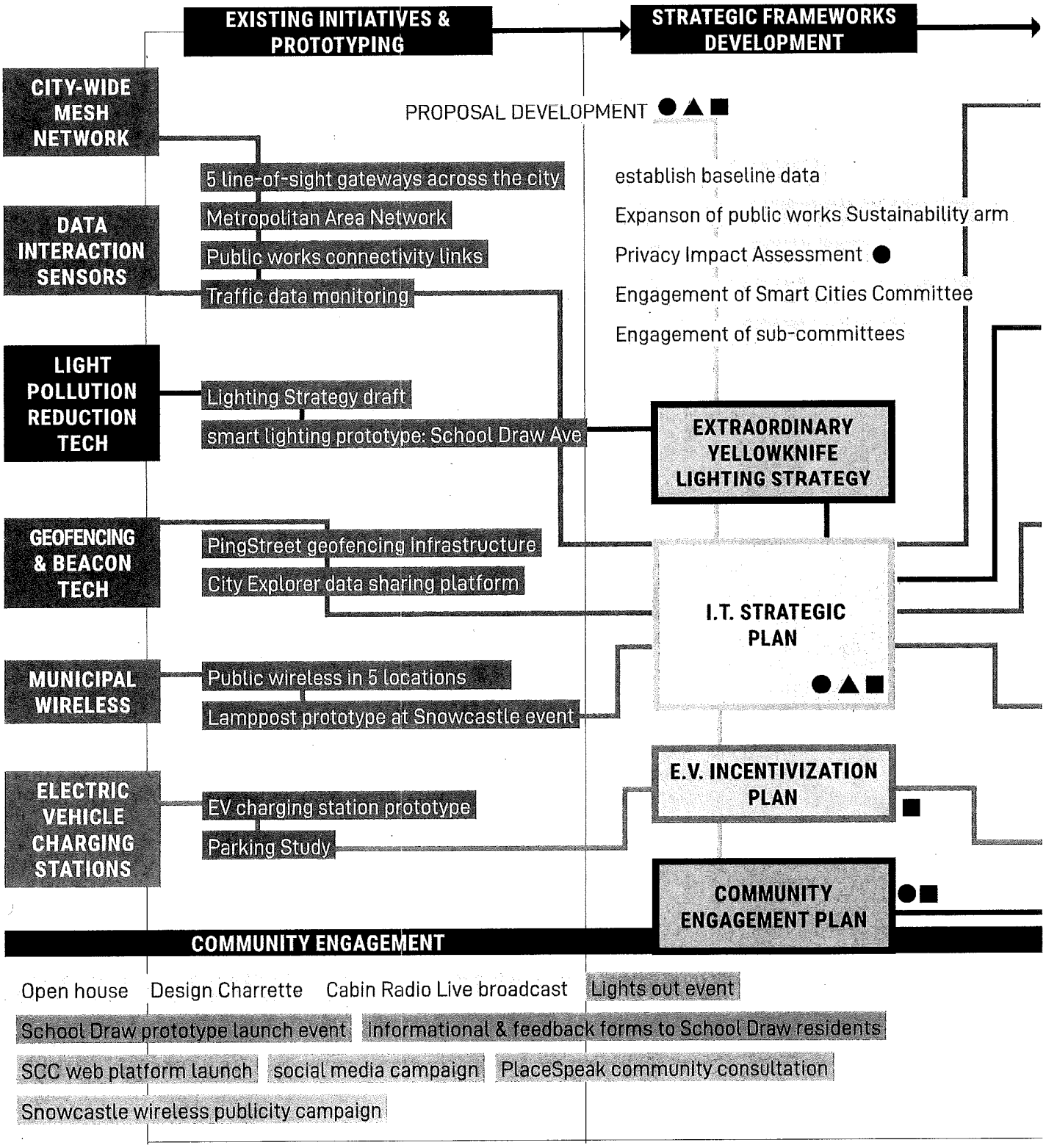
PROPOSED OUTCOMES PAYMENT TIMELINE



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CHAPTER 3

PROJECT MANAGEMENT



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RISK MITIGATION CHECKPOINTS

- ● privacy & security
- ▲ financial
- ■ stakeholder response

PROCUREMENT & IMPLEMENTATION

- Network design
- Backhaul development & Gateway installation
- engagement with utilities contractors ■
- selection of vendors & contractors by RFP process ▲
- hardware installation

- action plan for implemenattion
- Identify Extraordinary Neighbourhoods ■
- RFP process to select vendors & contractors ▲
- installation of smart lighting technology

- stakeholder engagement re: beacon technology ■
- "areas of interest" decision-making & development
- contractor selection ▲
- app development & testing... ■

- assessment of stakeholder needs ●▲
- bandwidth expansion
- hardware installation

- installation of EVSE based on incentivization strategy

OPERATIONS & MAINTENANCE

update training for municipal employees and contractors

review strategies at three- and five-year checkpoints

continually improve systems based on new technology & stakeholders feedback

MONITORING & REPORTING

contractor engagement & stakeholder response

offerings for IoT services

cost & reach of municipal services

Energy consumption comparison & reporting

Light pollution monitoring with photosensors

Reporting on Dark Sky-friendly trends

engagement with local tourism service businesses

reporting on nubmers for Northern lights tourism

Recording feedback re: aurora viewing experience

tracking of app usage & broadcasts reception

reporting on PlaceSpeak engagement

reporting on social media coverage

EV ownership per capita

tracking of energy consumption by streetlights, utilities and services

research & reporting on progress towards sustainablility targets

development of new layers on City Explorer for open source sharing of information ●

Extraordinary Skies launch campaign for lighting strategy implementation

resident feedback surveys ■

Extraordinary Skies tourism promotion

PlaceSpeak civic engagement forum ■

Publicity campaign: EV incentivization strategy

incentivization of research & innovation to encourage resident/stakeholder participation ■▲

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CHAPTER 3

PROJECT MANAGEMENT

The Project Management Plan aims to align all project outputs with the Strategic Planning initiatives and the City's guiding vision for Smart Cities. The focus is on the sustainable, long-term achievement of successful implementation activities. This necessitates a certain level of fluidity and adaptability, with built-in checkpoints to ensure continual stakeholder support, financial capacity, and data security. The preceding infographic summarizes the sequence of dependencies and scope of activities. Initiatives and outputs are categorized according to the five key impact streams, and will be filtered through a series of strategic frameworks to minimize risk and guide the team's decision-making processes moving forward.

These strategic frameworks will be informed by the ISO 37106:2018 standard and together will serve as the backbone of the Project Management Plan. As detailed below, these frameworks include: a Smart City Vision for Yellowknife, an Extraordinary Skies Lighting Strategy, an EV Incentivization Plan and a Community Engagement and Research Plan. Results from monitoring existing initiatives, infrastructure, and prototypes will feed into these project-specific strategies, which in turn will guide implementation activities in alignment with the community vision.

EXISTING INITIATIVES & INFRASTRUCTURE

The City of Yellowknife has several current or planned initiatives that demonstrate transparency, develop our partnerships, and establish a platform for community engagement and feedback. These initiatives include: an electric vehicle charging station prototype, a trial smart lighting

CASE STUDY: DARK SKY COMMUNITY



NACKA, SWEDEN

The lighting strategy used in Nacka considers the identity, the spatial, social, biological and the technical features of a site. In the North, a unique phenomenon to highlight is that the sun takes a longer time to rise and fall giving origin to an extended warm light and a long "blue hour" at dusk and dawn. In this sense, the lighting strategy plays an important role in re-describing the city's structure, scale and target point at night, facilitating us the ability to recognize the space and navigate through it. Light needs to be linked to time to change with the use of urban space throughout the day and the year, supporting human needs and encouraging meeting at nighttime. Considering biological conditions ensure the reduction of impacts of the light on human health, well-being and the natural habitats of animals and plants. This method helps to classify the urban space and their qualities to focus the light on humankind and their activities.

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project along School Draw scheduled for March 2019, the continued development of a city-wide data transmission network, Pingstreet app, Placespeak forum, City Explorer online platform, geofencing applications, and free WiFi in city facilities. The city's current data transmission network has collectors in multiple locations throughout the city which can forward information to City Hall and play a role in a future mesh network. The Smart City initiatives already underway in Yellowknife demonstrate the city's existing capacity to achieve this project's outcomes.



RISK MITIGATION THROUGH STAKEHOLDER ENGAGEMENT

To help guide this project, City administration will rely on the guidane of Council. This guidance can be provided in assortment of ways (the assembling of a committee, public engagement openohouses, ensuring that expectations and deliverables of the Smart City project dovetail well with the priorities and ongoing responsibilites of the City. Members of standing committees and directors of departments will influence the implemetnation of action items and fine tune the necessary metrics to evaluate success and mitigate risk.

The City recognizes that the implementation of this project will have ripple effects on an array of stakeholders. The gained experience of facilitating Smart Cities charette and public awareness sessions has created inroads with key stakeholders in tourism and economic development. It is anticipated that the City lean on the expertise with in its networks to ensure that the expectations are clear and that outcomes continue to allign with Challenge Statement.

STRATEGIC FRAMEWORK FOR IMPLEMENTING THE SMART CITIES VISION

The Smart Cities Vision will establish a holistic approach to managing both the new opportunities and the new risks posed by the versatile capacity of smart infrastructure. An external consultant will be determined by an open and transparent RFP process. This consultant will work alongside the City and its partners to build a replicable framework for northern innovation. In the context of this proposal, this strategic framework will be called the Information Technology Strategic Plan, or IT Strategic Plan.

This IT Strategic Plan will be a solid foundation of agreed-upon guidelines to mitigate risk in terms of security and adapt to changing technology. The Plan will establish rules for the treatment of personal information, integration of new technology with existing infrastructure, requirements for IT security, access control, auditing, and the retention and disposition of corporate electronic data. While flexible enough to adapt to changes from council or administration, the IT strategy will feed into the City's overall vision and have the potential to be adapted for use in other Northern communities.

Areas of focus for this strategic plan include: technology standards, privacy standards, an internal business improvement process, education and certification around new technology, and a guide for city departments on implementing and getting the most value from new technology. An allowance has been made in the budget for hiring an external contractor to develop this strategy in tandem with the City (discussed in more detail in the Financial chapter). At the three- and five-year mark, a major course correction checkpoint assessed by the Smart City Committee will confirm the alignment of the project's trajectory with the original vision.

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STRATEGIC FRAMEWORK FOR SMART LIGHTING

Building on the shared knowledge of White Arkitekter, the proposed Yellowknife Smart Lighting Implementation Strategy will take a comprehensive look at lighting in Yellowknife and suggest a strategic path to reduce light pollution, increase health outcomes, take advantage of our natural assets and adhere to the Model Lighting Ordinance (MLO). The MLO is the result of extensive efforts by the International Dark Sky Association (IDA) and the Illuminating Engineering Society of North America (IES). Among its features is the use of lighting zones (LZ0-4) which allow each governing body to vary the stringency of lighting restrictions according to the sensitivity of the area as well as accommodating community intent. In this way, communities can fine-tune the impact of the MLO without having to customize the MLO. The MLO also incorporates the Backlight-Uplight Glare (BUG) rating system for light sources, which provides more effective control of unwanted light. The BUG system is discussed in more detail in the technology chapter of this proposal.

Adoption of this ordinance will follow the established development, review, and approval processes of the City of Yellowknife and be informed by the Smart Cities Committee. The MLO is probably best adopted as an "overlay zoning" ordinance. This means that it overlays, but is different from, land-use zoning. It can be added to or integrated into existing ordinances or codes and cross-referenced to other applicable codes and ordinances such as the electrical code, the sign code, planning ordinances, etc. Ongoing renewal cycles will be included when adopting the ordinance.

The main tenet of the lighting strategy described in the MLO is the division of land into 5 lighting zones, LZ0 to LZ4. These are (1) no ambient lighting, which is for use in areas with little to no human activity (2) low ambient lighting, which is for use in rural and low density areas (3) moderate ambient lighting, which is for use in commercial business districts and high density or mixed use residential districts (4) Moderately high ambient lighting, which is for use in commercial corridors, high intensity suburban commercial areas, and town centers, and finally (5) high ambient lighting which is not a default zone and should only be used in special circumstances. The zoning considerations and recommended use areas for each of the five lighting zones provide the City of Yellowknife with a formula for re-assessing its current lighting strategy in order to develop a clear plan of where lighting zone ratings need to be upgraded or downgraded. Further conversations with the City's Department of Planning will need to occur to see how best to integrate these zoning suggestions.The outcome of this strategic lighting plan aligns with this projects outcomes of decreasing light pollution, improving the aurora borealis viewing experience, expanding smart lighting, and developing standards that can be replicated in other communities across the North.

STRATEGIC FRAMEWORK FOR ELECTRIC VEHICLE INCENTIVIZATION

Similarly to the IT Strategic Plan, the EV Incentivization and Penetration Framework will be developed in accordance with overarching city goals and in collaboration with an independent contractor. The City will use this plan to implement tools for EV incentives, while working with stakeholders like Northlands Utilities to build consensus and readiness for widespread EV adoption.

Following along the appropriate routes of assessment and approval, the development and implementation of this strategy would align with the 2015-2025 Community Energy Plan. The installation of EV infrastructure and subsequent increase in EV penetration would contribute to GHG emissions reductions for the City of Yellowknife which is relevant to the goals establshed in the 2015-2025 Community Energy Plan.

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STRATEGIC FRAMEWORK FOR COMMUNITY ENGAGEMENT

The Engagement Strategy for implementing the Smart Cities Vision is discussed in detail in the Engagement chapter and outlined in brief here. Past engagement with residents and stakeholders has set the precedent for a project that is firmly grounded in feedback and collaboration. The City is committed to the principles of openness and transparency, and will follow the recommendations of the Community Engagement Plan to build community awareness of Smart Cities. Administration along with relevant stakeholders help guide the implementation of the action plan and address budgetary considerations at agreed-upon checkpoints.

PROCUREMENT

The City's general procurement policy will be used as a template to develop a policy specific to the IT department and the Smart Cities project. The current standard policy specifies that procurement from a sole source is allowable up to $20,000. If the amount spent is between $20,000 and $50,000 a minimum of two quotes or a request for quotes (RFQ) is required. For procurement operations estimated at over $50,000, a request for proposal process (RFP) or a request for tender process (RFT) is required. The City also has several Standing Offer Agreements (SOAs) with companies for services that they use on a regular basis such as fuel delivery, minor repairs and maintenance.

Each of the technologies outlined in this proposal faces different challenges in terms of procurement, vendor choice, installation, and maintenance. The decisions made must reflect Yellowknife's particular Northern context: its remoteness, small population, and relatively high density and traffic. A procurement plan based on the IT Strategic Plan will address concerns regarding open data, security, ownership, and feasibility. Cities that purchase from vendors rather than developing the technology can devote more resources to policy & service design. The trade-off is loss of autonomy over the end product. Alternatively, projects that prioritize open data and software interoperability tend to adopt a design-build approach and rely on government support for funding. Due to Yellowknife's size and resources, the most feasible option is to partner with vendors and contractors. Due to the interoperability risks associated with a large pool of vendors, financial feasibility and availability of technical support are increased by limiting the pool of vendors. Based on data security concerns it follows that due consideration be given to the ownership of the end product, and must be evaluated when developing a procurement strategy.

CASE STUDY: EV CHARGING STATION STRATEGY

WHITE ARKITEKER

In implementing Electric Vehicle Chargers we can consider the following stakeholders, their concerns, and corresponding result indicators:

1. Municipality: Achieve sustainability goals while remaining cost-effective. Result Indicators: (a) Air quality improvements, (b) Climate change improvements, (c) cost-effectiveness
2. EV Users: Increased mobility (range & time of driving). Resulting Indicators: (a) Accessibility to chargers, (b) Growth in users
3. Residents (non-EV users): Optimize locations while managing parking pressures. Resulting Indicators: Increased utilization of chargers
4. Commercial Partners: Produce positive business case. Result Indicators: cost reduction
5. Grid Operators Concern: Safeguard Grid Quality Result Indicators: (a) risks of power outage / grid-congestion reduced

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City administration will work within the framework of existing policies and best practices to ensure fair procurement procedures. Considerations will be made on how to ensure that procurement protocol is in line with the unique realities of Smart Cities technology implementation. The intent is to keep control of the data while working closely with private partners throughout the proocess.

OPERATIONS & MAINTENANCE (O&M)

Within the 5-year scope of this challenge and beyond, effective O&M will necessitate new training for skilled employees at the City. For certain project activities, a vendor may also be chosen as the responsible party for ongoing O&M or training. Investment in local capacity will be vital to long-term support and future-proofing of the infrastructure. Simultaneously the project will generate jobs and cultivate a local labour market capable of working with innovative technology. Work will be done to understand labour demand surrounding Smart City technology in the context of regional challenges and needs.

CONTINGENCIES, COURSE CORRECTIONS & CONTROLS

Decisions made during the implementation phase are dependent on strategic plans to be developed in line with ISO 37106:2018 and with input from external contractors, partners, City Council, and City Administration. As detailed in the Performance Measurement chapter (Impact Stream A), project outputs will be evaluated at the three- and five-year mark to confirm that strategic plans and corresponding action plans are being adhered to; these checkpoints constitute built-in opportunities for course correction.

The Smart Cities Committee will ensure the adherence of outputs to agreed-upon standards at the three- and five-year checkpoints. Further opportunities for course correction are built into the sequencing of activities, as indicated in the Project Management flowchart. These control checkpoints have been divided into three categories, which respectively intend to:

- Assess budgetary constraints and develop a plan to mitigate risk (Financial Checkpoint).
- Ensure continued compliance with security protocol and protection of personal data (Privacy & Security Checkpoint).
- Gather and respond to feedback from all affected parties (Stakeholder Response Checkpoint).

Forums such as the PlaceSpeak app and City Explorer platform are in place to maximize the transparency of operations, open-source sharing of data, and opportunity for resident input. Partnership with the Yellowknives Dene First Nation heightens the project's adaptability, diversity of perspective, and range of impact. Expanding Yellowknife's Smart City infrastructure into the neighbouring community of N'Dilo will test the replicability of this technology in the North, and expand the beneficial impacts of the project. The involvement of consultants, academia and and utilities provides access to research, experience, and capacity, and serves as a solid foundation for the innovative strategies which will achieve our challenge statement.

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Statue of a musk ox outside of Yellowknife's City Hall in the winter

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CHAPTER 4

TECHNOLOGY

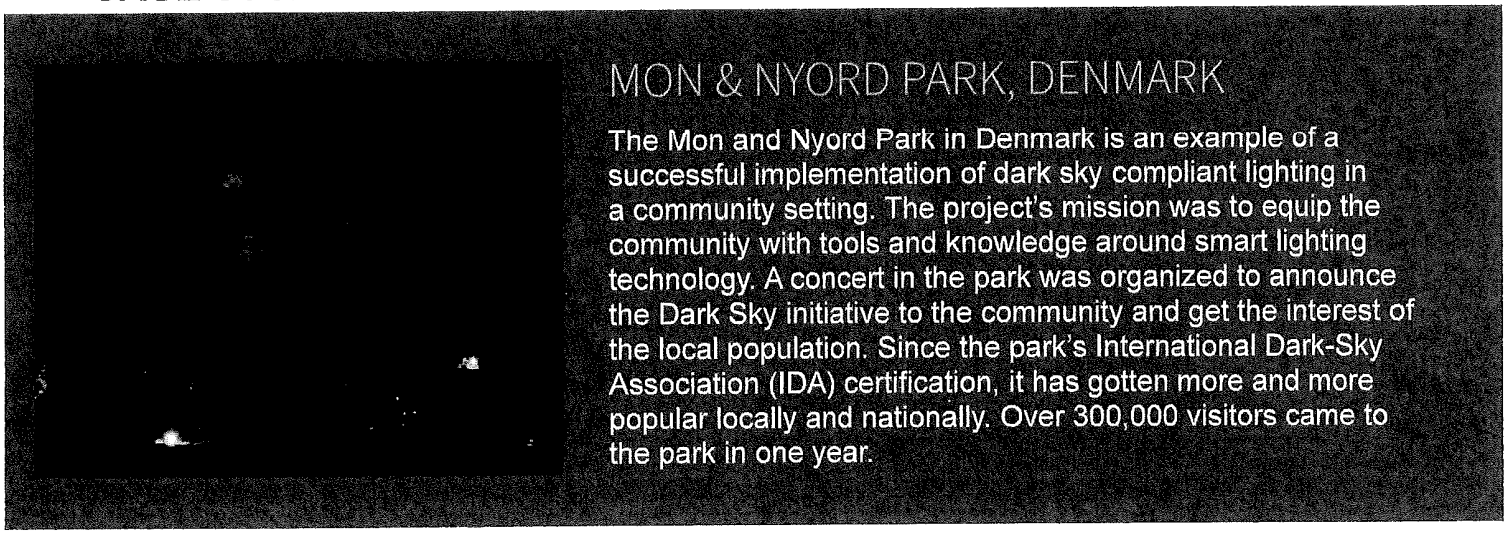
Transforming the ubiquitous lamppost into a beacon for sustainability is the backbone of Yellowknife's planned approach to become a Smart City. The implementation of this smart technology will be guided by the IT Implementation Strategy, which will set the ground rules for technology deployment, and improved policy. This chapter highlights technologies that have been identified in the proposal writing and research stage as promising options to help Yellowknife achieve its challenge statement. In alignment with the governance structure outlined in Chapter 5, the technologies and technology approaches outlined below will need to be approved and reviewed by City of Yellowknife leadership with input from the Smart City Committee.

The backbone of the Smart City vision for Yellowknife is the installation of smart street lighting infrastructure throughout the city. Lighting retrofits must fit within the principles identified by the lighting strategy outlined in the project management chapter and follow an ordered and logical process. The Implementation Strategy will also reflect engagement with the citizens of Yellowknife and their experience with and feedback on the School Draw Avenue lighting prototype. The Lighting Strategy will be developed according to these principles.

Switching to smart lighting has the potential to positively affect people, wildlife, the economy and the natural environment. Orchestrating this switch in the context of Yellowknife will also identify new standards and best practices that are replicable in other northern communities. The strategic thinking around the use of light has been guided by the experience of European leaders such as Copenhagen, and the Swedish experience and knowledge of White Arkitekter. The City will also take advantage of the experience and guidance of the International Dark Sky Association to inform Yellowknife's Lighting Plan moving forward. Project partner and current owner of Yellowknife's lamppost, Northlands Utilities, will bring their experience to the project as a leader in motion sensor lighting technology in North America.

The City will investigate and adopt new Northern-specific lighting best practices that guide light quality, pollution, intensity, and location of light, all with consideration towards Dark Sky principles. Additionally, integrating the combined experience and expertise of our project partners into our lighting strategy is a key step to ensure feasibility and scalability of our proposed technology projects. More on the structure of this smart lighting framework can be found in the project management chapter of this proposal.

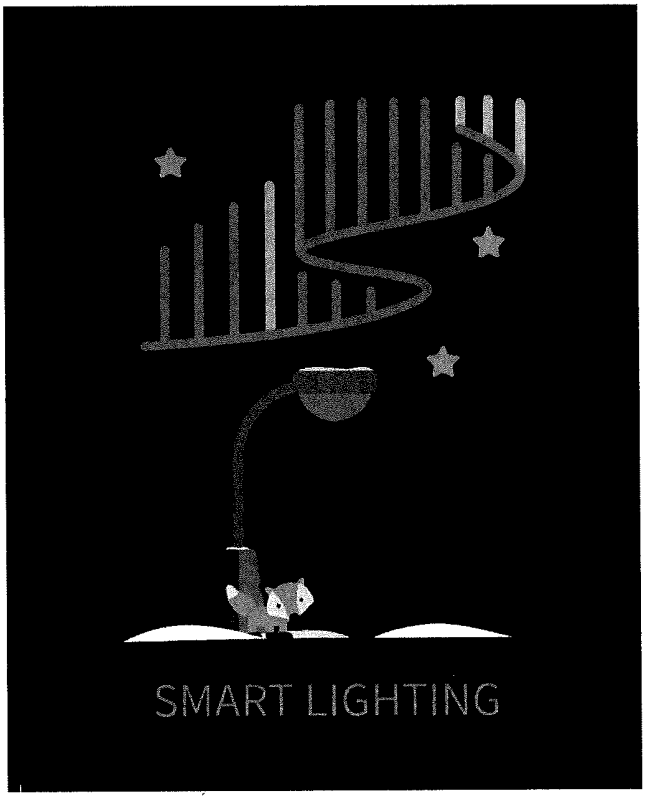
CASE STUDY DARK SKY COMMUNITY



MON & NYORD PARK, DENMARK

The Mon and Nyord Park in Denmark is an example of a successful implementation of dark sky compliant lighting in a community setting. The project's mission was to equip the community with tools and knowledge around smart lighting technology. A concert in the park was organized to announce the Dark Sky initiative to the community and get the interest of the local population. Since the park's International Dark-Sky Association (IDA) certification, it has gotten more and more popular locally and nationally. Over 300,000 visitors came to the park in one year.

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SMART LIGHTING

The switch from traditional non-responsive lighting to "smart" adaptive lighting is a technological leap that Yellowknife is prototyping on School Draw Avenue. This prototype will include approximately 10 smart lighting fixtures. Smart lighting in the Yellowknife context means streetlights that are connected to motion sensors which direct the gradual dimming and brightening of the lights in response to motion on the street. The light will be dimmed to a much lower illumination and energy use when the motion sensors are not activated. When a pedestrian, cyclist, or vehicle is detected it will increase to 100% brightness, equivalent to that of a traditional streetlight. The motion sensors that detect movement will initiate a communication pathway from one lamppost to the next that will trigger the subsequent lampposts to illuminate, expanding your field of vision in the direction you are travelling. As you move past a lamppost, the motion sensor will indicate to the lamp to begin dimming back down to the baseline level of illumination.

This vision for smart light is modeled off of the Dark Sky approach laid out by the International Dark Sky Association as well as the ATCO-led award-winning Intelligent Street Lighting Project in Lloydminster, Alberta. The precedent set by Lloydminster for up to 80% energy savings can inform the possibilities for future energy savings from a similar project in Yellowknife (Lopushinsky, 2018). By collaborating with ATCO subsidiary Northland Utilities, Yellowknife is testing the potential for energy, health and safety improvements, while engaging Yellowknife citizens, nearby homeowners and tourists and understanding the public perception, appreciation and challenges of smart lighting. This will help lay the foundation for a lighting strategy that has the potential to be replicated in other locations across the NWT and beyond.

DARK SKY APPROACH

While the focus of the Lighting Strategy is the smart technology, Yellowknife and Northlands Utilities will continue to be guided by the principles established by the International Dark Sky Association. A Dark Sky Community is defined as a community that shows exceptional dedication to the preservation of the night sky through the implementation and enforcement of a quality outdoor lighting ordinance, dark sky education, citizen support of dark skies and new guidelines for night lighting. A municipal lighting ordinance (MLO) zone plan should be created as a base to define the Dark Sky guidelines for lighting. This is discussed in more detail in the project management chapter of this proposal. Our Scandinavian knowledge exchange partners, White Arkiteker, have provided us with a useful and relevant perspective on lighting technology strategy that incorporates: uplight, glare and light trespass maximum acceptable values, lighting design for urban areas that can activate the city at night, and, crucially, lighting technology that can have the right type of light at the right place in the right moment. Additional examples of lighting strategies for winter cities include lighting policies that control light trespass, façade lighting post curfew hours, lighting that can adapt to the reflectance of ground surfaces and that can dim to a minimum when people are not around. This Scandinavian perspective will be integrated into the Yellowknife approach.

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LAMPPOST LIGHTING TECHNOLOGY SPECIFICS

LED lights have provided significant electricity and greenhouse gas savings over traditional high pressure sodium lights. Yellowknife has completed a full retrofit of their streetlights, but research from our technology partners, and a case study from Denmark, established that LED bulbs with a brightness of 3000 Kelvin or less have been shown to be the least disruptive to animal behavior and human circadian rhythms. The soft white lights from these bulbs is dimmable and even color-adjustable (White, 2019). The color of natural light varies according to the season and time of day and the ability of artificial light to align with these changes impacts both people and the environment. As part of this project Yellowknife will develop and communicate best practice for northern street lighting design.

MOTION SENSORS

The smart lampposts our technology partner ATCO piloted in Lloydminster used smart photocell sensors as motion detectors. This technology is relatively affordable and widely available and, having been tested in a similar climate to that of Yellowknife, appears to be the top choice for motion sensing technology.

ADAPTIVE LIGHTING

Temperatures below zero keep the streets covered by snow during a long part of the year. White and reflective surfaces need less light to be visible than darker and rougher surfaces, such as asphalt or gravel. In line with the seasonal changes, the City's light levels should be adjusted not only based on hours of darkness but also on the presence or absence of snow on the streets and thus the perceived brightness of the surroundings. Smart lighting in this case, can also include adaptive lighting that changes in intensity and even spectral composition depending on the season and time of the day. Having a sensor that measures luminance to trigger different light level settings is today not a standard solution, but is under development by a few known manufacturers in the Nordic countries. Extreme low temperatures can also present a challenge to the technology if sensors and fixtures are covered by snow and ice limiting their function. Mitigation of this risk could involve incentivizing research through the commissioning of a design charrette or an RFP process.

DEVELOPMENT STANDARDS

The Backlight-Uplight-Glare (BUG) rating system provides more effective guidance for unwanted light. The B rating takes into account the amount of light in the direction of the light source opposite from the area intended to be lighted, also known as light trespass. The U rating defines the amount of light into the upper hemisphere with greater concern for the light near the horizontal angles, also known as light pollution. Glare can range from annoying to visually disabling and the G rating takes into account the amount of frontlight. BUG rating limits are defined for each light source and are based on the internal and external design of the light source. The BUG rating limits also take into consideration the distance the light source is installed from the property line in multiples of the mounting height. All three elements of the BUG rating system are taken into account when developing a city-wide lighting strategy, and assist in the creation of lighting zones (detailed in the Project Management chapter).

RISKS

It is important to acknowledge that dimmable lighting will be a noticeable change for the public. Maintaining public engagement, monitoring feedback, and addressing concerns is a critical aspect of implementing this technology and will be addressed in more detail in the engagement section of this proposal. We fully anticipate concerns over safety and security, which will need to be addressed up front and in a positive and constructive manner to win Yellowknifers' trust and build confidence in Smart lighting technology. Targeted awarness campaigns in the prototype area can help respond to resident questions. Feedback and opinions will be documented and a reassessment will occur later in the process to evaluate any change in perspective.

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COST

One of the main challenges with lighting retrofits is the high cost and sheer numbers of lights in Yellowknife. The Lighting Strategy and pilot project will identify costs, concerns and lay out a scalable model to spread the technology throughout the City. Following the successful demonstration on School Draw, we believe the energy savings will provide valuable cost-benefit data to influence the completion of the lighting retrofits in Yellowknife and more remote diesel fueled communities throughout northern Canada.

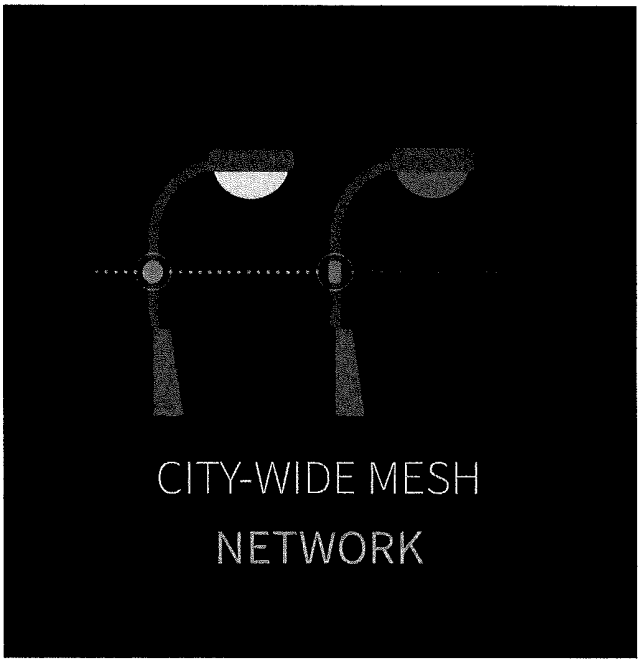
FUTURE-PROOFING

Another challenge is the future-proofing of the system. Technological advances in lighting are happening quickly and being a trailblazer includes risks of obsolescence and being eclipsed by new technology. The Smart City Committee will address this within strategies of IT and lighting to implement open and non-proprietary technology and regularly review and make adjustments for technological innovation and flexibility. This involves implementing a lighting system that allows some flexibility for updates in the near future. This is built on systems where LED modules are easy to replace, where sensors use standard-global connectors, and where the overall technical equipment is interoperable rather than customized.

QUOTE

"The City of Yellowknife has prime locations in the city to act as collectors where multiple neighborhoods could uplink to. This means that in each neighborhood, a cabinet or building with equipment can be placed to be a connection point for the lampposts in that area. This equipment can then forward the data to our collector sites and then to City Hall or beyond (Internet). This equipment routes Internet Protocol data(IP) but not other protocols such as Blu-tooth or Zig Bee that are used by many sensors manufactured today. These sensors will need technology to communicate with that can translate to the IP network and beyond"

- Chris Golt, Network administrator
City of Yellowknife IT Division



MESH NETWORK

Yellowknife, like most cities, is connected by a spider web of lampposts on almost every street, park, parking lot or corner of the city. In a typical city each one acts alone, powered by an electricity feed, and turned on or off by a photocell, in every sense they are a relatively simple technology which does not often live up to its almost limitless potential. Imagine a city where these lampposts were connected to each other, and to a central information hub via a set of gateways. The potential is ripe for City managers, utilities, contractors, and entrepreneurs to connect sensors into the network to collect information, control a myriad of products and provide residents with more efficient and better services and knowledge.

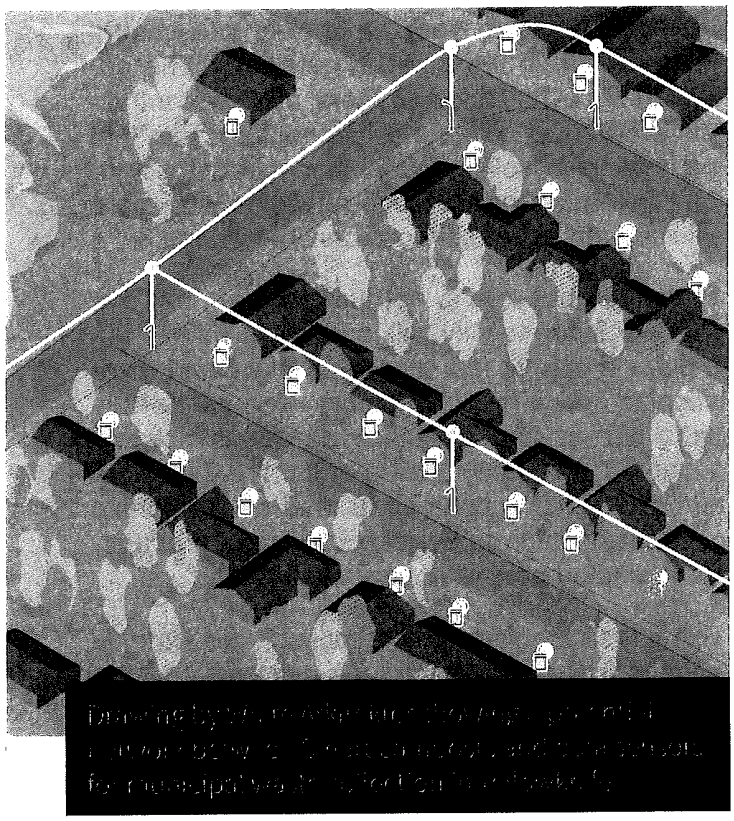
This mesh network is not just a dream but it is possible, and the City will investigate how to put in place a plan to test a network that could revolutionize how information is provided by the City and other services. This is an ambitious task and requires continual improvement to the City's current system of gateways, as well as supportive policies for information collection and management, and an optimized control centre.

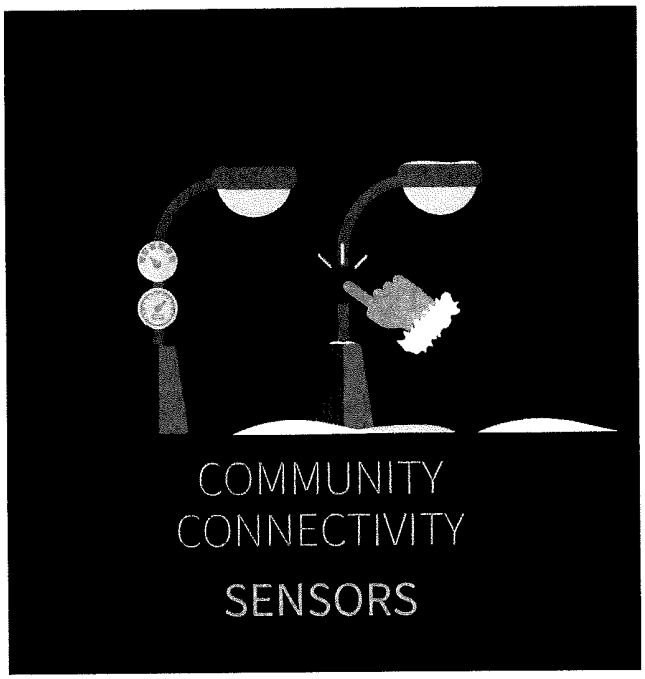
This mesh network will enable improvements to municipal services such as delivery of water, collection of sewage, and monitoring and maintenance of roads and trails (not just snow clearing, but drainage, permafrost damage, traffic flows

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and streetlight controls). Contractors of services such as waste collection, electricity, fuel, trucked water and sewer delivery could use data to improve services and reduce costs. Further down the road the City envisions opening up the mesh network capabilities and information to businesses and innovators to test applications in the harsh and unique set of northern circumstances. This will create economic benefits and build a knowledge and information based economic hub that puts Yellowknife into the forefront as a small, well controlled laboratory for innovation in Smart Cities technology.

None of this is without risk. The City must ensure its strategy and policy are sound and that Council, Administration and citizens of Yellowknife understand the Smart Cities Vision. Openness and transparency are paramount to gaining trust and confidence in this vision. To do this will take an investment of money, staff and time to ensure the strategic building blocks are in place, while engaging the public and stakeholders and field-testing and improving the technologies that will help build our Smart City.





SENSORS

The potential for lampposts to be the foundation of a smart city lies primarily in their ability to act as the network to move information gathered by a range of sensors. The following list of potential sensors was informed by research from our technology partners. There is a vast and growing list of technologies that are possible here, and they are further expanded by creativity and circumstance in how they might be used. This category is intentionally large in order to demonstrate that this smart cities project has potential beyond the scope of this funding and timeline. The intention of Yellowknife is to use sensors to improve municipal services first, outsourced services second and open it up to the limitless possibilities of entrepreneurs in the tech industry when the conditions are right.

PIPED WATER LEAK DETECTION

It is estimated by the Public Works Department that 30% of the city's water is lost to leaks in the system. Aging infrastructure, exacerbated by the challenges of permafrost contribute to the pipe-water system inefficiencies. The cost of this water loss to city finances is measured in hundreds of thousands of dollars a year.

The installation of a smart sensor onto existing fire hydrants provides a promising leak detection monitoring solution already in use in Medicine

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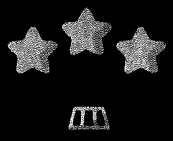
SENSOR TECHNOLOGY

TEMPERATURE, HUMIDITY, CO2



Climatic data
- monitor climatic changes
- forest fire smoke detection
- pollution level

LIGHT POLLUTION METER



Brightness of the night sky
- monitor light pollution
- data for astronomy

PARKING OCCUPANCY



Vehicle detection in parking spaces
- monitor vehicle data
- parking lot occupancy in real-time

WATER LEAK DETECTION



Water leak detection in water conducts
- measure water consumption
- wireless water conservation

LEVEL DISPLACEMENT



Measures distance to objects
- snow fall monitoring
- ice on roads

WASTE BIN DETECTOR



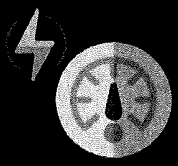
Collection efficiency
- waste management
- help public works
- full/ empty/ flame risk/ fallen

PUSH BUTTON



Multi-purpose buttons linked to different functions
- survey on satisfaction
- panic button
- control lights

METER READING



monitor consumption
- electricity monitoring
- gas fuel tank
- disfunction detection
- comparison of data

MOTION DETECTOR



Movement of people or objects in a 4 meter radius
- dimmable lighting control
- efficiency of the lighting strategy
- pedestrian safety

PERMAFROST



Permafrost temperature measurement
- data for geolegist
- monitor changes in permafrost
- thermistor reading

NOISE METER



Noise level in dB
- monitor noisy/quiet spots

WATER/SEWER LEVEL



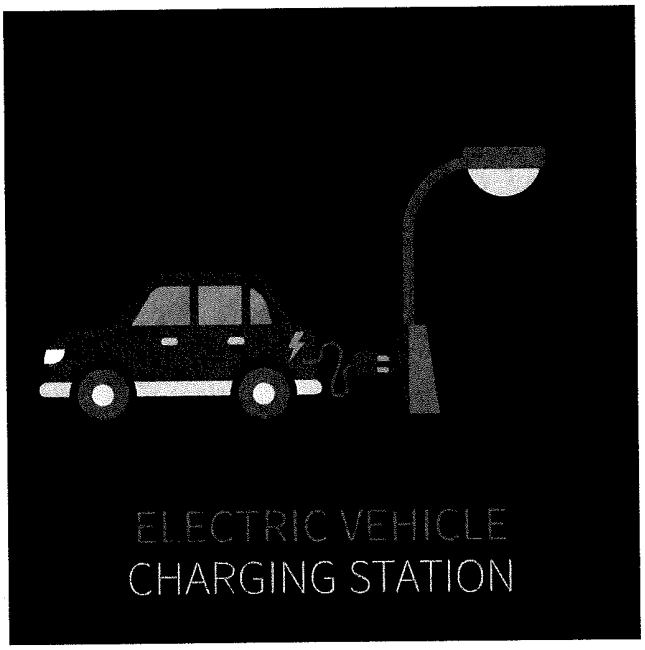
trucked water efficiency
- water/sewer tank level
- measure water consumption

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Hat, Alberta. A portable node uses an acoustic sensor to monitor the sound emitted by water flow in the hydrant and attached piping system. It is highly sensitive to acoustic variation and is capable of detecting even the faintest leaks that traditional monitoring systems often miss. In addition to the sensor itself, the node includes analysis software that monitors the progression of the leak over time. A network of lampposts that would transmit this data to a central data center would enable improved real-time leak detection and potentially save the City considerable time and money.

WATER LEVEL MONITORING

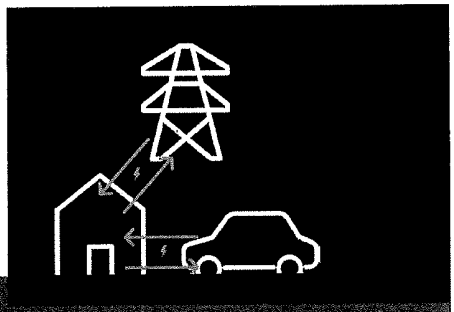
Rather unique to the north, trucked water and sewage services fill and empty tanks in and under houses in permafrost areas. Roughly one quarter of Yellowknife houses, including all houses in Dettah and N'dilo, have water delivery on a bi-weekly schedule. This isn't always on an efficient schedule, and an on-demand service could potentially better service these residences using a sensor installed into tanks to relay water level information to the lamppost, and subsequently to the control centre and provider. Challenges with running out of water, and unnecessary service delivery could save citizen's money.



EV CHARGING STATION

The City of Yellowknife wants to be forward looking, and embracing electric vehicles (EV) as the future of vehicular transportation is part of becoming a Smart City. Generally there are two streams of thought on how to do this: incentivize EV purchases or build accessible charging infrastructure. The City is exploring the considerations of both options. Currently there are two EV charging stations in Yellowknife. The City recently installed a phase II charger at City Hall to charge a new electric vehicle owned and maintained by





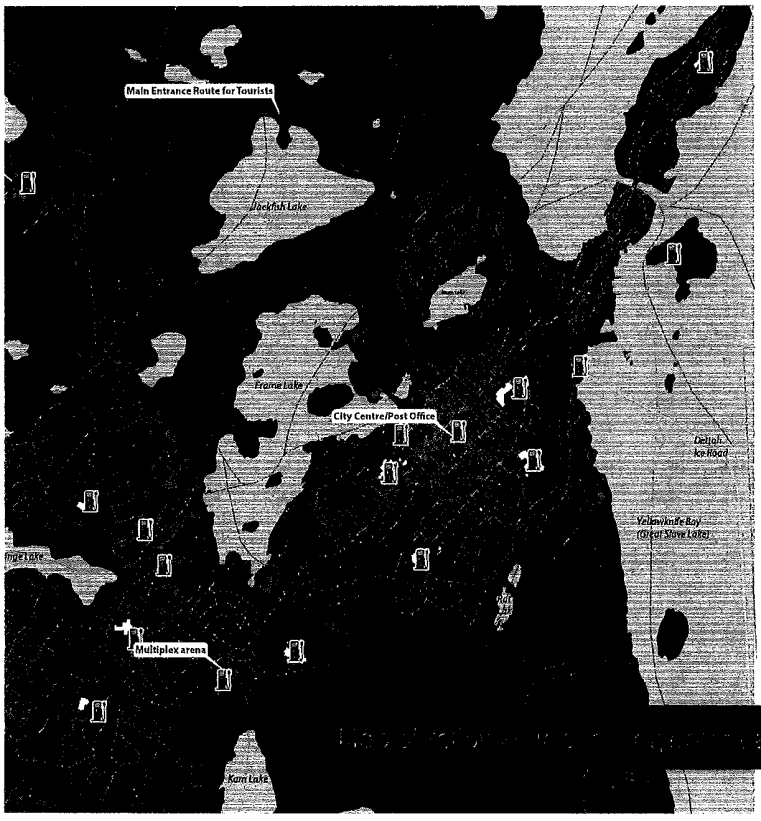
VEHICLE TO GRID

Vehicle-to-grid technology (V2G) helps to stabilize the energy grid through the installation of a new charging system for EVs. The battery of an EV becomes a mobile energy storage system that can supply energy to the grid during periods of high demand. Residents can be paid for the service their car offers to the grid. This is very promising to reduce diesel dependency in a lot of communities in the Northwest Territories.

the new YK Car Share Cooperative but available to City staff during working hours. This initiative will demonstrate the effectiveness of EVs to work in the frigid north and show leadership by the City.

Yellowknife is also working with Northlands Utilities to install one phase II EV charging station on a lamppost located in or in close proximity to the downtown core. The potential of EV charging stations integrated into lampposts provides promise for broadening the demand and possibilities of EVs as electricity becomes the standard fuel of the next decade.

Not anticipated in the timeline of this project, nevertheless a future potential application of EV connectivity via lampposts is vehicle-to-grid energy management technology. Piloted successfully in Copenhagen in 2016, this technology allows electric vehicles to act as mobile energy solutions. When not in use, the vehicle is plugged into stations that connect to a city's energy grid and enables them to provide excess energy to the grid or recieve energy if necessary. This optimizes the power available to the grid and is especially useful in the case of unexpected surges in power usage (Automotive World, 2016).





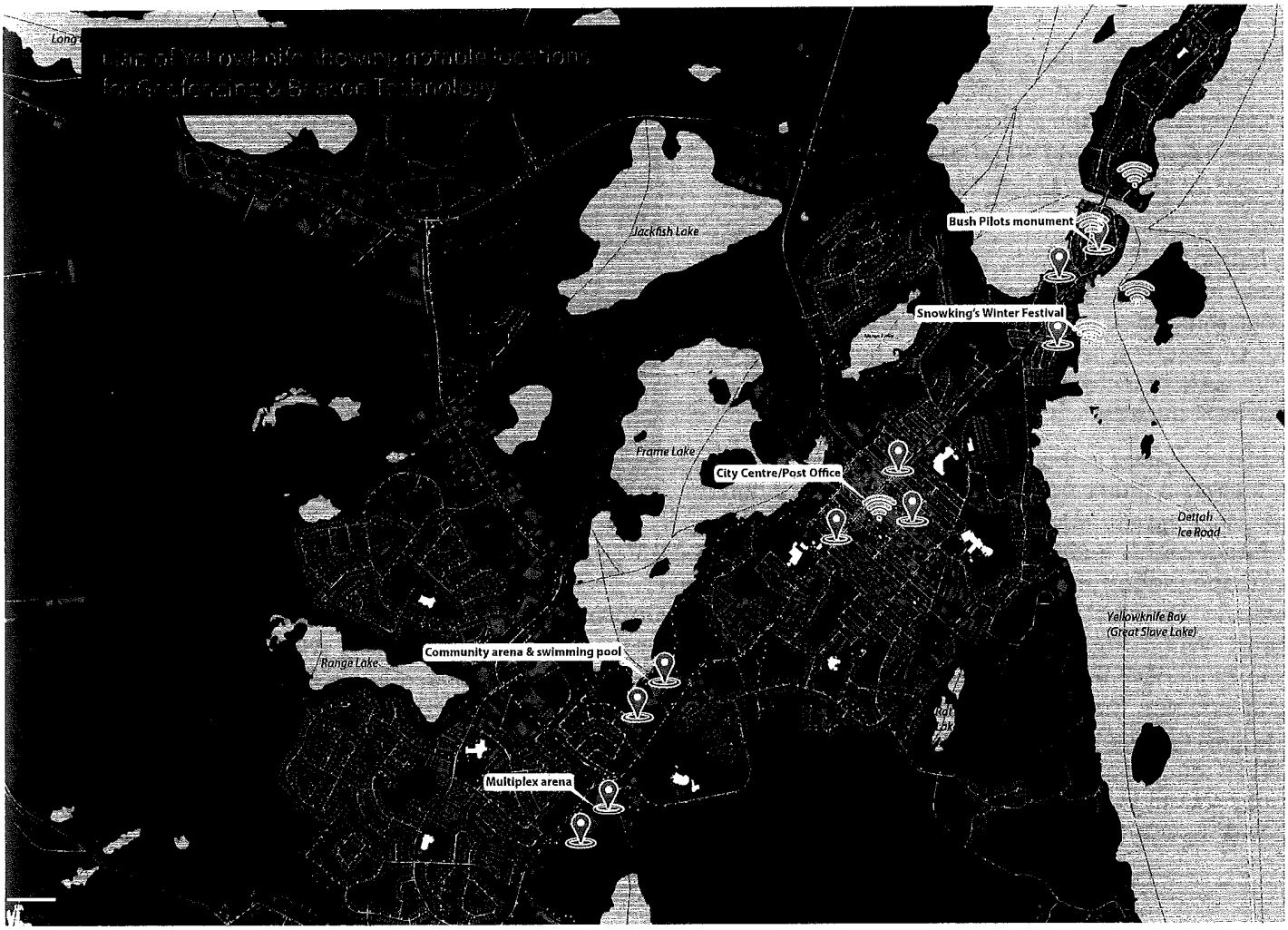
WIFI

Incorporating WiFi access points into lampposts in key junctures in the City will broaden the existing free municipal wireless network limited to municipal facilities. Exploring how to make digital services more accessible will increase wellbeing for both residents and tourists. The sharing of information is pivotal to the transition towards a smart city.

This is simple technology and easy to replicate and build on. Although not a key part of the Cities Smart City vision, it is another example of the ability of the lamppost to provide services and transmit information. Currently, there are six municipal locations in the city that offer free WiFi: Center Square Mall, the Library, City Hall, Samba K'e park, the Multiplex, and the Fieldhouse. After engaging with residents during a two-day Design Charette in August, 2018 several more sites were put forward as locations where WiFi would be useful: the Snow Castle, Old Town, the Government Dock, the Airport, and the Boat Launch at the Yacht Club. The City is considering the extension of its WiFi at the Snow Castle to improve the experience for tourists and locals at this key tourist location.

The creation of wireless connectivity between lampposts is a solution which could implement multiple smart city services that require a mesh

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network as a foundation. With the expansion of the public municipal wireless network come several risks, both to the user and the owner. These might include Man in the Middle Attacks (MitM), snooping/sniffing, and malware distribution. The City can help to limit these risks through public education. Risks to the network owner include bandwidth and network abuse (i.e. Denial of Service) and the possible use of the network for cyberattacks (O'Higgins, 2016). Public WiFi operators can protect themselves from liability of network misuse by implementing Terms and Conditions of Use Policies which includes: an indemnity statement, an acceptable use policy, a privacy statement, and a description of service level commitments (O'Higgins, 2016).

CASE STUDY: FREE WIFI



TRONDHEIM, NORWAY

The city of Trondheim is a case study in the use of a municipal wireless network in a larger community. The network auto-connects the user's smartphone device to the most appropriate wireless network nearby at any point throughout the city. Also available is a free wifi map of Trondheim which works without internet connection, helping to find the closest free hotspot.

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GEOFENCING AND BEACON TECHNOLOGY

Geofencing and beacon technologies are platforms for public engagement and ultimately work towards this project's goal of developing an active and informed community. The more immediately available and realizable of the two technologies is geofencing. Geofences are fixed regions that define an area with a width between 200 meters and 2 kilometers on a map. Using GPS technology and cellular coverage, when a user of the associated mobile application passes into that region, they will receive a notification on their device. The notification, or broadcast, is a short 140 character or less message whose contents are defined as part of the geofence. The associated application in Yellowknife is the PingStreet app which is free and widely available to residents. The feasibility of implementing geofences has been demonstrated by the installation of 3 active geofences within the City of Yellowknife. While these geofences do not currently have any associated broadcasts, their broadcasting capability has been piloted with over 1500 subscribers. Expanding this capacity using the smart lamppost infrastructure would increase the City's ability to engage directly with residents to share information like pool schedules, road closure alerts, and event notifications. One of the geofences that is active currently is at the Yellowknives Dene First Nation. They have expressed interest in using the geofence to broadcast cultural events throughout the year to both tourists and residents. This tech collaboration with a First Nations organization is an important feature of this project's replicability in other northern contexts.

QUOTE

"Dimmable city lights!! How about an application that we could use to get alert when awesome northern lights are showing up."

- *Yellowknife citizen*

A beacon uses bluetooth technology to broadcast a push notification that is triggered when the user comes within a radius of 3 to 25 meters of the beacon. It functions in essentially the same way as a geofence and, within the context of this project, is especially useful for tourism due to the small broadcasting radius. A series of beacon disks installed in lampposts near historical or geographical points of interest could act as an automated active walking tour of the City. It is important to note that users of the PingStreet app would be required to give their consent to receiving notifications from the City via both geofence and beacon broadcasting.

RISKS AND MITIGATION

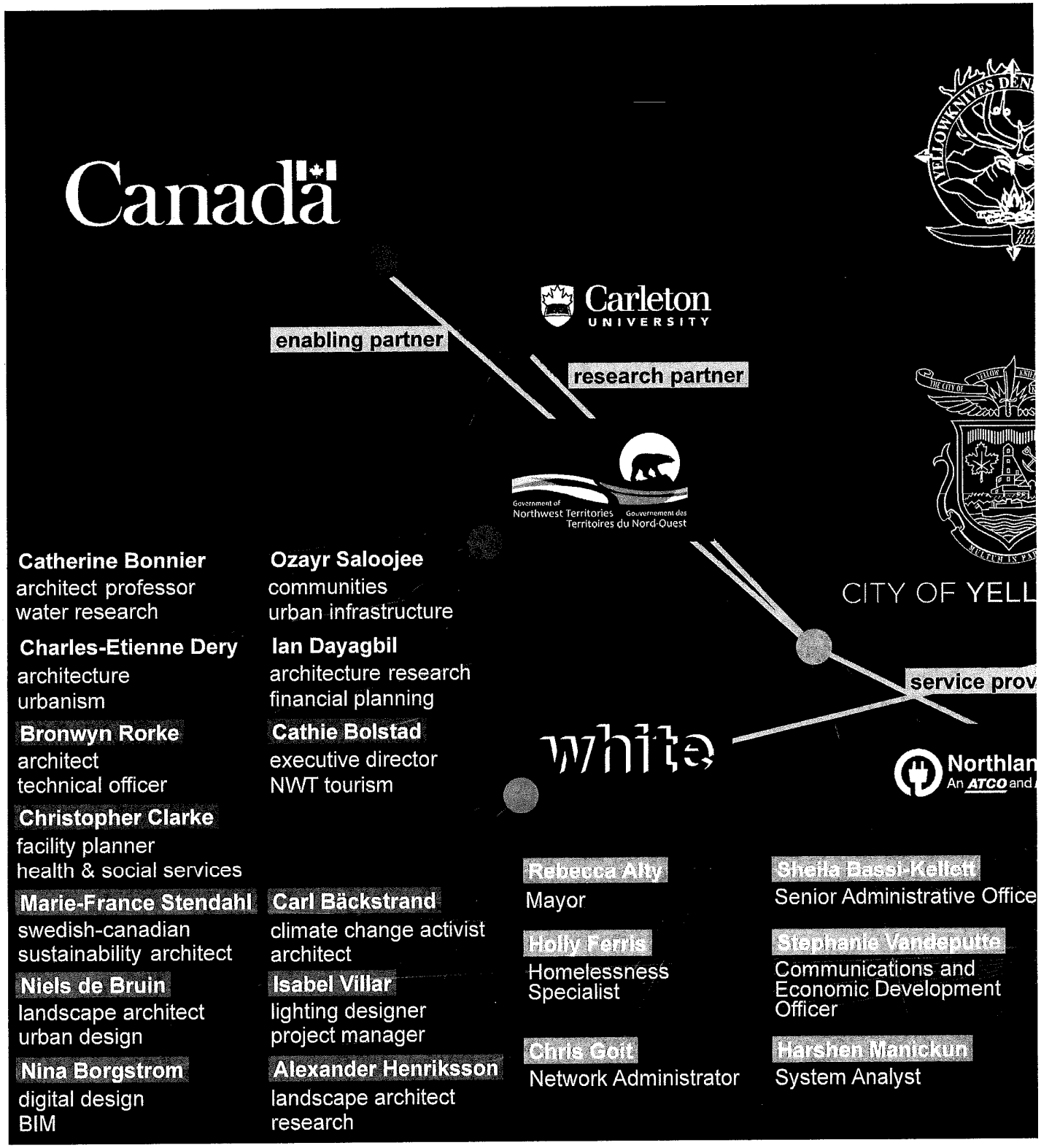
The standard risk associated with geofences and beacon technology is user privacy. Especially for those who are more technology illiterate, a push notification from the City, even if a consent gateway is established, could be seen as a privacy threat. This project has and will continue to take steps to mitigate the real and perceived risk of this. The City will remain vigilant and up to date on all of their IT systems. We are already in communication with the Office of the Information and Privacy Commissioner of the Northwest Territories regarding the completion of a Privacy Impact Assessment. Privacy concerns such as these are addressed more fully in the Data and Privacy chapter of this proposal.

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CHAPTER 5

GOVERNANCE

CIRCLE OF INFLUE

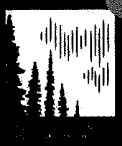


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ENCE

GENERAL PUBLIC

GOYATIKO LANGUAGE SOCIETY



ECOLOGY NORTH

knowledge exchange partner

ARCTIC ENERGY ALLIANCE

Astrid Gagnon
tourist accountant

Alex Borowiecki
NWTLA architect

Daniel Gagnon
tourist engineer

Grégoire Blais-Dufour
reporter

Stephen Fancott
senior architect

Jason Snaggs
CEO

Johanne Black
Lands Director

Marose Sundberg
councillor
YKDFN

Elizabeth Liske
research coordinator

William Gagnon
carbon green buildings
climate change activitist

Courtney Howard
emergency doctor
climate change activitist

Rosalie Abbey
eco. health determinants
sustainability

Kristel Derkowski
architecture
graphic design

Stuart Casgrain
engineering intern
water resources

Eric McNair-Landry
polar explorer
board member

Daphné Cyr
architecture intern

Craig Scott
climate change specialist
Executive Director

Thevishka Kanishkan
landscape architecture

Antonin BC
architecture intern

Maxime Giasson
architecture intern

Laura Bush
communications

Linda Todd
coordinator

Mark Heyck
ED

Nick Walker
EV
Energy Management

John Carr
Sr. Technical Specialist

Daryl Fetaz
supervisor
operations

Jason Newton
engineer

Michael Auge
Manager, Sustainability & Solid Waste

Chris Greencorn
Director, Public Works & Engineering

Chris Vaughn
Sustainability Projects Coordinator

Richard McIntosh
Communications and Economic Development Officer

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CHAPTER 5

GOVERNANCE

Collaborative innovation happens when there is a need or a problem whose solution requires creative input from an array of stakeholders.The City's Smart City Vision encompasses the ideas, concerns and expertise of our indigenous peoples, our local enviromental non-profits, our utilities and international support. Smart Cities are increasingly complex, with an ever higher number of stakeholders who hold diverging and converging interests. To manage these diverse partners and stakeholders, a rigorous governance framework is necessary.

The organizing priority of this project's strategy is to maximize the opportunity presented by the Smart Cities Challenge in order to produce the most benefit for residents of the City of Yellowknife. Ensuring security and transparency of the process, the outputs, and data collected is an essential component of this strategy. Any resources put towards realization of smart city outcomes will be filtered through a governance structure created to secure these aims. A template for Smart Cities governance can be found in the Sustainable Development for Communities guidelines document published by the International Organization for Standardization, ISO 37106:2018. This set of guidelines "establishes requirements for a management system for sustainable development in communities, including cities, using a holistic approach, with a view to ensuring consistency with the sustainable development policy of communities." (ISO website)

LOCAL AND HORIZONTAL GOVERNANCE

Strategic plans will be be developed in alignment with City Council mission and the community's vision, as well as ISO standards. Creating a locally relevant governance framework is essential to the success of the overall implementation strategy. The approach thus far has been to prioritize a horizontal partnership structure with several different parties and stakeholders. This horizontal structure aligns with the City's vision of an inclusive and well-managed community which is welcoming and inclusive. As both a centre of government, law, health and social services, the City's traffic and density are unique within the context of northern Canada. This presents a set of governance challenges that are similarly unique. By meeting these challenges with a horizontal governance approach, this project is aiming to ensure that all frameworks are transparent, efficient, and reflective of the needs of the community.

The governance structure of this project is intended to formalize the roles of partners and stakeholders via the creation of a Smart City Committee. The concept for this committee was introduced in the performance measurement chapter of this proposal. This committee will provide direction and information throughout the lifetime of the project, both during the 5 year scope of this proposal and beyond.

PROJECT PARTNERS:

YELLOWKNIVES DÉNE FIRST NATION

"Weledeh Yellowknives Dene are one of the peoples of the T'satsaot'ine. The people were known for the pots, knives, and other tools they made from copper collected in the northerly parts of their territory. Before trapping for the fur trade changed traditional occupancy and land-use pattern north of Tinde'e (Great Slave Lake), the traditional territory of the T'satsaot'ine consisted of lands around Great Slave Lake north to the Coppermine River, and east to the Thelon River. Since 1959, descendants of the T'satsaot'ine tribe have lived mostly at Deninu Kue, Rocher River, Lutsel K'e, Reliance, Ndilǫ, Dettah and Enodah. Today, the people call themselves and their territory after the great T'satsaot'ine leader Akeh-Cho: The Akaitcho Peoples and Akaitcho Territory." (excerpt from ykdene.com)

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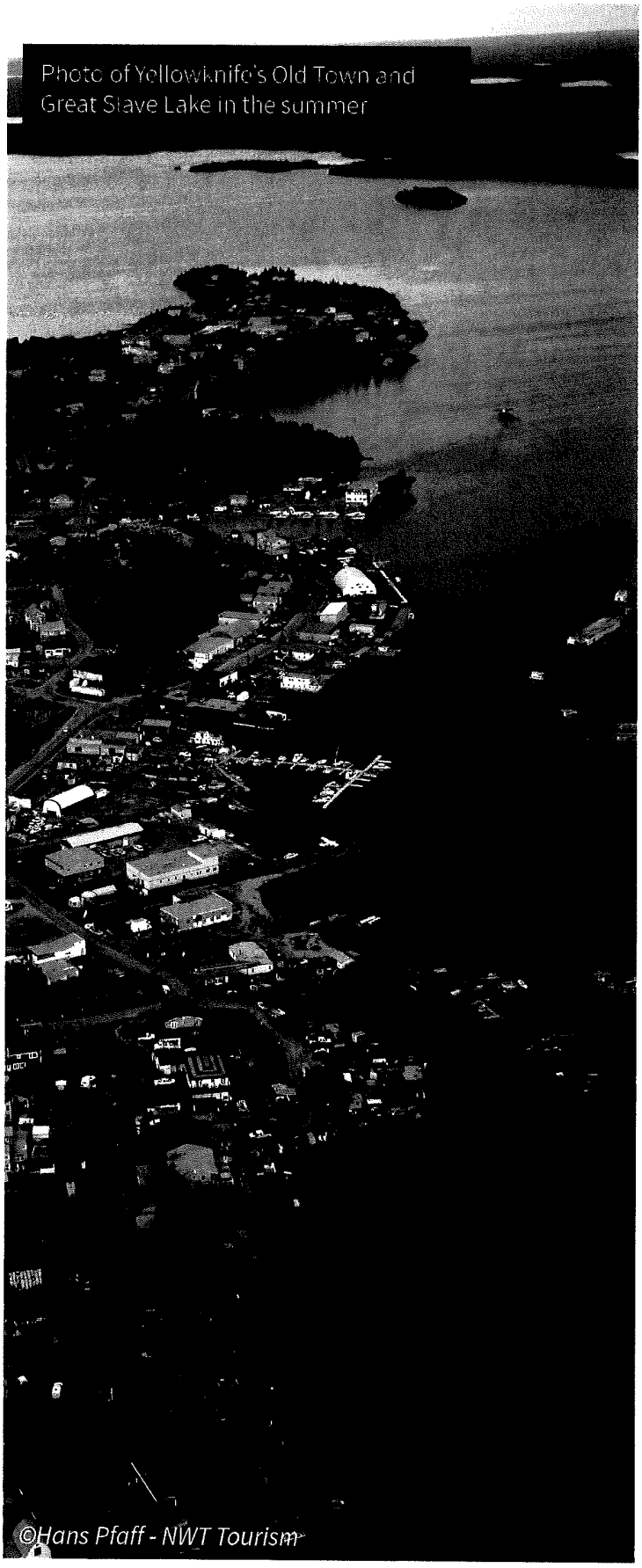
This project is an opportunity to strengthen partnerships with the Yellowknives Dene First Nation (YKDFN) neighbours and to achieve inclusivity, horizontality, transparency and a mutually beneficial arrangement that is in the best interest of residents of Yellowknife, N'Dilǫ and Dettah. Moving towards a holistic and inclusive framework for partnership with our First Nations neighbors is a consideration of critical importance for this project. To this end, YKDFN staff was present during the design charette and the YKDFN community was backed financially by a portion of the $250,000 grant from the first phase of the Smart Cities Challenge. Moving forward, YKDFN participation will be an enabling partnership, in which the City would share resources and try to encourage a continuation of smart city tech into N'Dilǫ.

ECOLOGY NORTH

Ecology North was founded in 1971 in Yellowknife. Over the years the organization has served the City of Yellowknife as the pre-eminent environmental non-profit organization in the North. Ecology North has developed a strong relationship and partnership with the City of Yellowknife, working closely together on many projects, such as the municipal recycling and composting programs, this Smart Cities Challenge, and many co-hosted events throughout the years. As an organization, Ecology North is also active in City of Yellowknife committees and consultation sessions. As a non-profit, Ecology North has a horizontal, inclusive process for decision-making and includes stakeholders and residents in the decision-making process, incorporating diverse perspectives. For this Smart Cities Challenge, the partnership with Ecology North has provided a network for knowledge exchange on sustainable principles. They have facilitated knowledge exchange with the Scandinavian architecture firm White Arkitekter and the Carleton University Urban Research Lab.

NORTHERN CENTRE FOR SUSTAINABILITY

Ecology North and YKDFN are currently partnered on another relevant initiative that will re-



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inforce the outcomes of the Smart Cities project. The Northern Centre for Sustainability (NCFS) is a project that will leverage federal, private sector and academic funding to build the first Living Building in the circumpolar North, and the first carbon-negative building in Canada. This building will be a demonstration in downtown Yellowknife for replicable, scalable, and adaptable cutting-edge technology for northern settings. An innovation hub in the building will be an incubator for emerging green businesses, entrepreneurs, special interest groups, and indigenous youth. By providing a space for innovation, the NCFS is positioning itself to be a potential Smart Cities partner.

WHITE ARKITEKTER AB

Ecology North has been developing research relations with the White Research Lab at White Arkitekter AB, the largest architecture firm in Scandinavia based in Gothenburg, Sweden. White is an expert in nordic design, and facilitates the transfer of knowledge and practices directly to local architects. White has acted as a sub-consultant to Ecology North as they provided them with case studies on Scandinavian Best Practices for electric vehicle charging stations, urban lighting systems, urban planning, urban design, and the integration of the natural and built environments in the best way possible. Ecology North approached White for a partnership with this question: how can we exchange knowledge? To this point, White has provided much valuable perspective in the visioning of this project.

TECHNOLOGY PARTNER: NORTHLAND UTILITIES

Northland Utilities and their parent company ATCO have been the technology partners for this project since its inception providing technological expertise in the area of adaptive lighting strategies for the project's duration. Representatives from ATCO attended the 2-day design charrette in 2018 and have been involved in the ongoing feasibility studies, in the implementation of prototypes, and the monitoring and collection of data. ATCO states that "ensuring [they] operate in a transparent, ethical and accountable manner is critical in creating strong and sustainable value for [their] share owners and in promoting the company's well-being over the long-term" (ATCO, 2018). In addition to their technological expertise, this demonstrates ATCOs compatibility with this project's own scope and vision.



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POTENTIAL ACADEMIC PARTNER: CARLETON RESEARCH LAB

The Carleton Urban Research Lab was co-founded in 2017 by Professor's Catherine Bonier and Ozayr Saloojee. The focus of the lab revolves around questions of water, cities and equity. It is both an academic and outreach unit in the Azrieli School of Architecture and Urbanism. The lab regularly hosts academic and public events through symposia, workshops and design charrettes. This proposal has benefitted from the expertise of the lab in the areas of Smart City technology, including risks and mitigation strategies and future-proofing, as well as in the areas of data and privacy and project management.

INCREASING CAPACITY

With increasing demand for municipal information technology services such as smart sensors and equipment through Internet of Things functionalities, the City of Yellowknife will be looking at hiring another coordinator in 2019 to increase capacity in this department.

SENSITIVE DATA

In order to retain community control over sensitive data, this project's approach to partnerships will prioritize in-house technology development and maintenance, and limit the number of vendors involved. The City of Yellowknife will retain initial ownership of the information collected through the Smart Cities Challenge infrastructure, and in accordance with applicable legislation, it will be up to City Council to decide on the use of this data. Additionally, part of the funding from this project will be directed toward creating a step-by-step guide for entities interested in buying data generated by Smart City infrastructure and using it for commercial purposes. Sequentially, this guide would need to be developed after the creation of a comprehensive IT Strategy Plan as discussed in the project management chapter. The process of ensuring that the sensitive data usage plan complies with the comprehensive IT Strategy will also be the purview of the Smart City Committee and will serve as a privacy and security "checkpoint" or opportunity for course correction and risk mitigation.



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CHAPTER 6

ENGAGEMENT

Information technology can be an ever changing and mysterious thing, and the use of technology for the betterment of society can be fraught with challenges. The City of Yellowknife's engagement with residents and interest groups has been very positive, with lots of energy and excitement about the prospects of a Smart City in the north. But undertones of concern are present about privacy, use of data and the ever-present concept of "big brother." This chapter highlights the engagement to date, lessons learned, the plan to engage and communicate with Yellowknifers, and the vision and concepts of Smart Cities. Also highlighted are some of the risks and risk management techniques we are intending to use to get to the city's goals of using knowledge and technology to improve the community's social and environmental well-being by transforming the simple lamppost as a beacon of sustainability.

ENGAGEMENT TO DATE

Yellowknife is a small city that feels like a big town, and meetings between public officials and local citizens happen on the street or in the check-out line everyday. The City of Yellowknife approached engagement using its partners, in particular Ecology North, to get the word out about this project in a grassroots way. Grassroots engagement is effective at building a base of concerned and engaged citizens, that was built on through events, a multi-stakeholder charette and communication plan. The City will build on this approach by spending time in the first two years of the next phase of the project engaging and working with stakeholder groups to build trust in the City's approach, but also to gain feedback about how people see Smart Cities improving their lives.

This starts at the top, and City Council have been engaged and supportive from the very beginning. On April 23, 2018 council moved to unanimously endorse the Smart Cities proposal (City of Yellowknife, 2018). Through close communication with City staff and partner organizations, Council has endorsed sustainable development, climate action and using technology to help improve outcomes for all Yellowknifers.

OPEN HOUSE

An Open House event took place on April 3rd 2018, just before the first proposal. Invitations were sent out widely with the objective of gaining ideas and thoughts on using the lamppost as a beacon of sustainability. ATCO demonstrated the technology with motion-sensing luminaires and Ecology North worked on generating ideas and building grassroots support.

We received over 50 individual responses to our request for feedback, and compiled and evaluated this information to help guide us in drafting our proposal. Residents identified key areas of concern, and discovered areas that had not been previously considered, which were incorporated into the project proposal. The community engagement Open House was an invaluable tool to understand the issues at the forefront of residents' minds, and allowed the partners to develop a project and potential solutions that truly meets the needs of Yellowknife.

MULTI-STAKEHOLDERS 2-DAY DESIGN RETREAT

In August of 2018, the Smart Cities Team organized a design retreat at the Yellowknife Ski Club. Taking the time away from computers and meetings would allow all participants' creativity to be stimulated, at the edge of the forest beside Great Slave Lake.

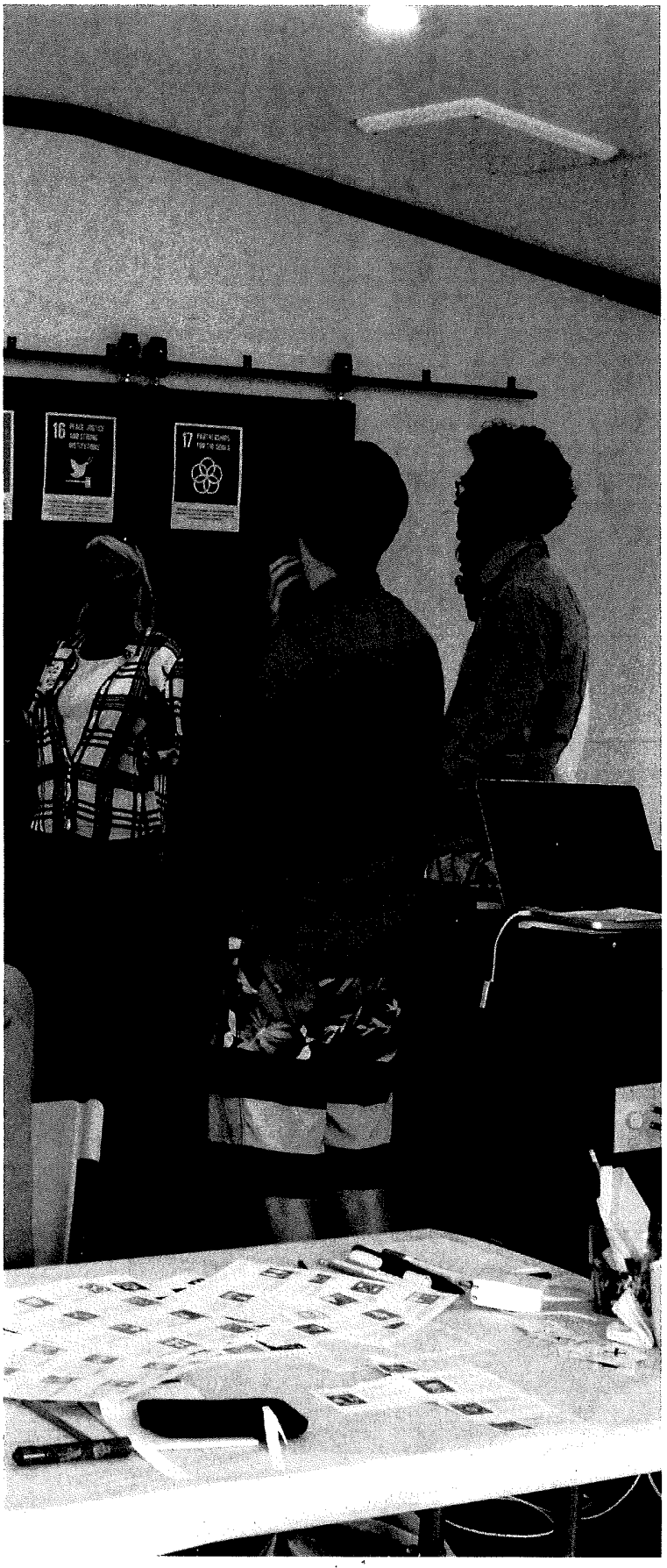
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The full 2-day meeting welcomed participants from all walks of life to share ideas with an innovation mindset. The first day welcomed many Yellowknifers from a diverse range of groups, including but not limited to the tourism industry, academia, architects, landscape architects, and First Nations.

The second day of the charrette was more intimate, and focused on the technical details of implementing a smart street lighting strategy. Those in attendance had vested interest in the proposal, as they would be working on its implementation. This design charrette was a joint facilitation between Ecology North and White Arkitekter AB. Northlands Utilities delivered their knowledge of the lamppost system and technical know how, Yellowknives Dene First Nation shared their deep connection to the land and transformational thinking, and the architects, engineers, politicians, environmentalists, bureaucrats and everyday people brought their Northern innovation, ideas and comments to the table.

The community design charrette was developed to encourage sharing and open discussion through interactive activities. Facilitators initially sought to identify participants' perceptions of Yellowknife and build on the concept of sustainability in a Smart Cities construct, build on the concept of smart lighting that would improve people's connections with the sky and nature, and improve our thriving aurora tourism industry. Many new ideas were brought forward which were duly recorded and discussed and people were truly engaged and excited about the prospects of the Smart City and smart lighting. The full design charrette report is found on the City's Smart Cities Challenge website.

Our community engagement format enabled us to bring together participants from all our partner groups, along with their individual expertise. Participants who attended could engage

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in discussions with all parties in a one-on-one or small group format. From these discussions, participants could better understand what exactly the Smart Cities Challenge was, some ideas already developed in terms of specific issues the City needed to address and potential ways to address these issues. Participants were invited to ask questions and provide feedback throughout the one-on-one engagement, and then after they had a chance to interact with all the partners as well.

Some guiding questions were displayed on different boards throughout the room and people were invited to write their action ideas on a post-it note for each one they wanted.

Though we invited attendees to answer these questions directly, we also encouraged them to provide further feedback that they might have had. The amount of feedback we received impressed us. On top of this, we engaged a local radio station, Cabin Radio, to attend the first hour of our session and broadcast the entire time through Facebook live to encourage more resident to come. Thanks to our varied promotional methods, we saw solid attendance at the engagement session and received feedback that has helped guide our proposal.

LIGHTS OUT EVENT

On November 20th, in what is one of the darkest and gloomiest times of year, the City held a Lights Out Event to bring awareness and excitement about how light pollution impacts the city, and how the Smart City Challenge intends to tackle lighting issues. The City turned out the lights of City Hall and Samba K'e Park to symbolize future efforts and showcase the night sky. Mother nature had other ideas on this blustery evening, but regardless a good turnout and interesting conversations about what night means to Yellowknife were had.

CONSULTATIONS AND SIDE CONVERSATIONS

Yellowknife is blessed to have what must be one of the most engaged populaces in Canada. This is seen in the number of civil society organizations that work to improve all manner of social, environmental and other disparities and challenges. By choosing to work with Ecology North on this project, the grassroots of the environmental movement were engaged. Ongoing engagement with tourism providers and NWT tourism helped the team understand the tourism opportunities and challenges. Northlands brought the knowledge and tools of its Innovation Hubs to the table.

YELLOWKNIVES DENE FIRST NATION

Yellowknife is founded on Chief Drygeese traditional territory of the Yellowknives Dene First Nation (YKDFN). The twin communities of N'dilo and Dettah share borders, and many YKDFN residents live and work in Yellowknife. The City and YKDFN also work closely on shared infrastructure, festivals, and building a better overall community together. YKDFN were invited to all consultation sessions and participated in the Design Charrette, where ideas and plans to incorporate technologies into N'dilo were conceived and developed. Relationship building around a shared vision has continued with discussions at the leadership level, and at the grassroots between Ecology North and YKDFN staff.

The Smart Cities project will further build on this relationship by bringing principles of reconciliation to the project by actively partnering and sharing resources gained from the Smart Cities Challenge. The City and YKDFN are looking to

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forge a new bond based on the promise of technology, a growing tourism industry and celebrating culture and heritage.

SOCIAL MEDIA

The City has a communication plan, and has been working on tools to further its engagement using social media, traditional media and other tools such as Placespeak and the Pingstreet app. This is a weakness the City has had to date, developing and enacting this Communication Plan. The process of researching, learning and developing what this proposal will look like for the City is an iterative one. The City wants to be clear with regards to its Smart Cities messaging in order to best manage expectations.

DIMMABLE LIGHTING SCHOOL DRAW PROTOTYPE

As our flagship prototype the School Draw dimmable light installation will highlight a new look for streetscapes in town. The City intends to use this project to highlight the Smart City project and show residents how this technology will improve the night time experience for Yellowknifers and tourists.

To evaluate and build public support for this prototype Ecology North and City Staff interact with residents in the pilot area to explain the project, answer the inevitable questions about what people in the neighbourhood are going to experience and help the team understand people's concerns while building excitement around this prototype. By asking for written feedback, we hope to develop a baseline of knowledge and concerns, and will follow that up after the prototype to evaluate people's experience with the lights, and whether it changed their enjoyment of Yellowknife's Extraordinary Skies.

The City will also celebrate reaching this milestone with a celebratory event in which the partners and the public will get to see the lights working for the first time. This will be the first time that the public will visibly see a manifestation of what their City can look with smart lighting.

CITIZEN QUOTE

"I think it is a brilliant idea. I think it's great... We were just talking about how to integrate services for bicycles, because a lot of us are year-round bikers."

- Aleta, Yellowknife resident



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FUTURE ENGAGEMENT

Smart Cities are a relatively new concept and a challenging one to define and communicate. The City has chosen not to immediately communicate a Smart City strategy and concepts that are not yet fully developed, but anticipate following the ISO 37106:2018 standard and developing an IT Strategy in the first year of implementation to improve communication and engagement that will follow.

The City at this point without pre-supposing the future strategy and policy direction hopes to embrace concepts of openness, transparency, interoperability, non-proprietary and citizen-centric IT and similar themes for engagement. Tools and strategies will be developed to embed this view so the City becomes a leader in working with its citizens to improve outcomes for everyone. To improve this the City will continually ask for input into new ways to incorporate Smart Cities concepts into its strategies and action plans.

Approaches that the City intends to take to get to this point will be to use our current engagement and outreach tools to gather knowledge. These include Placespeak which is a location based civic engagement platform, and the app PingStreet which provides real-time access to helpful information and engaging tools. Along with ubiquitous social media outlets like Facebook, Twitter, Instagram, and the Smart City Yellowknife website, the City will continue to use the person-to-person, and stakeholder engagement that have been the main platform for engagement to date to communicate the Smart City message.

The plan will lay the groundwork for the use of other tools within the City to reach out to new stakeholder groups. By developing a Research and Engagement Working Group to promote this plan, the City will encourage the public, entrepreneurs, and targeted stakeholder groups to submit expressions of interest and ideas to make the City smarter. Funding in the form of an engagement budget will be provided in years 1 to 5 and each year there will be a different focus (transportation, IT, sensors and tourism, etc) in which the public will be asked in a challenge format to give the City practical, doable ideas for implementation. Other uses of the funds from the engagement budget might be to ask stakeholder groups (ie. artist community to use art to highlight smart city prototypes) or ask seniors to test a technology or envision what a smart city is for them, or hosting workshops for youth to work with technology. Other options might be to host a hackathon in which tech entrepreneurs, or university students from across the country are invited to participate to build solutions that fall within the criteria of our Smart City Vision and concepts.

Other engagement tactics could be to talk with random citizens and ask them how a Smart City or smart streetlights might improve their health, safety or sense of being. Similarly, working with new immigrants to see what needs or wants would make their early transitional years easier could shed light onto areas of improvement. To do all this the Smart Cities Implementation budget will support real hands on learning, workshops, participation with schools and civil society groups. Each of these stakeholder groups brings will attempt to bring out individuals and groups of

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CHAPTER 7

DATA & PRIVACY

PREPARING A PRIVACY IMPACT ASSESSMENT

Part of this strategy is communicating with the Office of the Privacy Commissioner (OPC) to prepare a Privacy Impact Assessment (PIA) that covers the width and breadth of this project. As part of the preparation process for this proposal, the City of Yellowknife has established contact with the OPC and through initial discussions determined that a PIA was not needed at this stage of the project as data is yet to be collected and no privacy impacts are being made. City staff will continue to work closely with the OPC as the project progresses to determine which technologies and aspects of the project require PIAs and to perform this work as necessary prior to the implementation of any potential Smart Cities technologies.

EXISTING POLICY

The City of Yellowknife has established and made public their efforts to integrate security and privacy considerations into municipal technology. This is evidenced in the City's website's privacy policy, which notes user de-identification and gives a complete list of the non-identifying information that is recorded. This sets a precedent for data privacy and security that the Smart Cities Project can expand on. Because the majority of the technologies proposed in this project are not currently in use, their privacy impacts will have to be evaluated by the City or by an independent contractor before they are officially launched.

With regards to compliance with The Personal Information Protection and Electronic Documents Act (PIPEDA), this project in its current iteration does not deal with any personal information. As part of the project management strategy, however, this should be reassessed periodically.

CASE STUDY: ILLINOIS INSTITUTE OF TECHNOLOGY

The Illinois Institute of Technology (IIT) has designated the campus a "living laboratory" by building a microgrid on IITs main campus to experiment with smart technologies. IIT is currently piloting a smart street lighting system configured in a mesh network that communicates with lights that are controlled by the Centre-for Smart-grid Applications.

IIT has also piloted two prototype applications (a) emergency response application, and (b) Safewalks mobile application. The Safewalks application adjusts the brightness of streetlights relative to the pedestrian traffic as determined by real-time data.

IIT is particularly interested in cyber-security for their networked streetlight system. They have identified three areas of vulnerability: (a) the communication network, (b) the remote server, and (c) end devices. Smart software is important in maximizing the utility of smart hardware. Cybersecurity is the most important concerns of IoT in critical services that addresses interests of public trust.

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SMART CITIES CHALLENGE: AN OPPORTUNITY

Collectively the municipality and its partners recognize the Smart Cities Challenge as an opportunity to preemptively address emerging issues regarding technology, ownership and security. As a frontrunner in specifically Northern-Canadian innovation, Yellowknife is well-poised to develop secure frameworks of governance with the well-being of its residents as a central priority. The governance structure ensures diligent and consistent dialogue with a diverse range of residents and stakeholders. The City's commitment to accessible, open-source formats is demonstrated in existing infrastructure like the City Explorer portal and Open Data License Agreement. Moving forward, the development of an IT implementation Strategy can provide the opportunity to solidify a long-term practical approach to secure data management. Emphasis will be placed on ownership structures that retain municipal control of data, as well as a framework for adaptability of open-source policies to suit changing needs and technologies. Investing in smart solutions for the Yellowknife context translates readily to applications in remote and cold-weather communities across the country.



Tourists viewing the Aurora Borealis above a tipi at Aurora World in the winter

©Adam Pisani - NWT Tourism

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CHAPTER 8
FINANCIAL

Transforming into a Smart City has the potential to improve the services the City offers its citizens and improve the way it offers those services. It will help the City improve internal efficiency by providing more effective structures for communication and data transfer. The up-front investment required to implement these improvements will be paid back through a variety of benefits and service improvements in the future. The following preliminary budget will highlight the estimated costs and the outcomes and some anticipated cost savings that will be triggered within the five year Financial Plan of the City. The preliminary budget is summarized in the budget document on page 66, and will be split generally into the following five sections: Smart Cities Strategy, Extraordinary Yellowknife Lighting Strategy, EV incentivization Strategy, Research and Engagement and Operations & Maintenance budget lines.

SMART CITIES STRATEGY

The Smart Cities Budget will be the largest single budget area and will encompass much of the technology that most people think of when they envision a Smart City. Consistent with the proposal this preliminary budget will not provide too much detail into the costs of individual technologies, as decisions will depend on the Smart City Strategy, research and engagement and the approach to implement the action plan coming out of the strategy. This approach maintains flexibility and doesn't pre-suppose the outcomes. Dollar figures will be used to limit the scale of technological deployment within the five year budgeting window.

The budget for Smart Cities Strategy will include the Strategy itself and development of corresponding IT policy and tools. There are also improvements to Information Technology within the City itself, namely improving the IT hub, connectivity improvements, and expanding the gateways city-wide. Further to these key improvements, the Strategy and further research will highlight approaches (and estimated budget lines) to mesh network development, expansion of geofencing, beacon technology, wifi expansion, sensors and new technology areas.

EXTRAORDINARY YELLOWKNIFE LIGHTING STRATEGY

Similar to the Smart Cities budget the Extraordinary Yellowknife lighting budget will be dependent to a degree on the strategy and lighting plan developed in the first year. This strategy will highlight priority areas within the city and set the conditions for expansion of the smart lighting, based on the evaluation of the School Draw prototype and lighting strategy. Budget lines for lighting have been included in the budget page and will be a considerable portion of the budget.

ELECTRIC VEHICLE INCENTIVIZATION STRATEGY

A relatively small portion of the budget, the EV Incentivization Plan will highlight a Smart City approach to Electric Vehicle integration into Yellowknife. This will primarily entail piloting and evaluating EV charging infrastructure tied to lampposts and how to leverage this with policy, education and awareness tools to encourage adoption of EV's into a Smart Cities framework.

RESEARCH AND ENGAGEMENT BUDGET

Included in the preliminary budget for this project, which is detailed on the following pages, are considerations for research and engagement. In contrast to the technological projects and associated budgets, the project areas of research and engagement are intrinsically less clearly defined. Maintaining public and private engagement and promoting strategic research around the availability and feasibility of various Smart Cities tools and technologies is an essential component to the success of this project, and will require an

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ongoing budget. Funding will be allocated for research and engagement purposes through the guidance of the Yellowknife Smart City Committee. Decisions on allocating the annual funding to meet the intent and vision behind a Smart Cities framework will be made using an effective, varied and multi-stakeholder approach.

OPERATIONS & MAINTENANCE

The City is going to need the capacity and a coordinator. The Smart Cities Coordinator will be housed in the Sustainability branch of the Public Works and Engineering Department, which is responsible for community energy, waste and broader sustainability initiatives. The Smart Cities Coordinator will manage contracts, coordinate the committees and working groups, coordinate between departments and partners, and general project management of the the Smart Cities project. There will be additional requirements in other departments such as IT, Communications, Public Works and Planning that will be coordinated by the internal existing budgets of those departments.

CASE STUDY:

THE COLUMBUS WAY

In 2016 Columbus, Ohio won a $40M fund from the US Department of Transportation. The non-profit organization that won the bid raised an additional $450M by leveraging public, private and academic associations to develop a Smart Columbus project focused on 'smart corridors', a smart grid and smart street lights. With a vision "to be the model for connected cities for the future" its approach to using narratives to engage citizens in a 'collective vision' from a central hub is a model that Yellowknife can aspire to.

CONSIDERATIONS FOR LONG-TERM OPERATIONS & MAINTENANCE COSTS

There are definitely concerns about the long-term costs of increasing the number of staff and operations budgets with additional technology, actions and engagement demands. Through the accounting and financing mechanism already in place, City Administration will continue to reassess and strategically invest in the Smart Cities project. It is envisioned that energy savings, water savings and improvements to municipal services will more than offset any future costs. Key to this project is developing clear baselines and evaluation protocols to understand, value and communicate the results of pilot projects to corroborate the argument and continue to receive public and council support for funding.

LEVERAGING THE SCC FUNDING

The City recently invested in an institutional grant writer and funding analyst. The role of this new position in relation to the Smart Cities is to support with the leveraging of the Smart City budget to expand the funds available for prototype development, technologies, engagement, research and IT. The goal will be to provide additional funding every year for the project and to extend the five year length of the funding to maximize outcomes for Yellowknife's Smart City evolution.

COST SAVINGS

Yellowknife will see improvements in the well being of citizens as the Smart City Plan is unrolled. There will also be corresponding financial savings that will be linked to the rollout of the technologies. Although it is not possible to fully forecast savings, due to the unknown nature of costs, this project anticipates savings on several fronts. The dimmable lighting will be more energy efficient than the current LED lighting. By dimming

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the lights to a lower electrical load for the majority of the time, there is an anticipated savings of both energy and cost. Currently Northland Utilities owns the lampposts and rents them to the City. The smart streetlights will reduce energy which should translate in a cost savings to citizens.

The introduction of sensors linked to the mesh network will also help the City to reduce costs. Although it's too early to forecast what those savings might be, there is evidence to suggest that city services would be improved by sensors, and those cost savings could be reinvested to improve municipal service delivery. A few promising applications are in the early detection of water leaks, improving the efficiency of trucked water schedules, solid waste removal efficiency increases and trucked sewer pump-out. There are considerable costs to water treatment, but in Yellowknife an additional cost is heating the water to 4 degrees Celcius to help limit freezing as the water spreads out around the system. A conservative assumption of a 10% reduction would equal over $20,000/yr saving and save 59 tonnes of CO2.

Another important positive impact though will be to improve the long term growth of the tourism industry. In 2017, aurora tourism brought in $57 million to the Yellowknife economy. But the Aurora tourist economy is cyclical and there is more and more competition for lucrative aurora tourism visits. By taking a Smart Cities approach, installing smart lighting that makes Yellowknife's Extraordinary skies more visible, and providing beacon technology and other tourism products in the home language of aurora tourists, the City of Yellowknife will set itself apart from the competition and ensure a stronger tourism product and boost in revenues. Finally, the City is very excited to transform Yellowknife by putting the pieces in place for cold weather innovation in the Smart City realm. An innovation based knowledge economy will promote entrepreneurial and business opportunities, add a growing sector to the economy, reinvigorate the downtown, and make Yellowknife into a unique laboratory for Smart Cities innovation in a northern setting.

Another opportunity for potential is with ties to academia. The City is well positioned to improve partnerships with academia and the Smart Cities framework would be a big area of potential growth, as would the proposal to bring a Polytechnical University to Yellowknife, and how that campus could be grown from scratch as a Smart Campus. These ideas have not been fleshed out in this proposal but the City is eagerly anticipating opportunities to leverage the Smart Cities challenge into a new and burgeoning growth area in the City.

Approximately $25,000 was budgetted for the pilot project of which half was dedicated to initial capital costs and the remaining for lights and installation. The installation of eight lights works out to approximately $1,500 per light.

The $5M award would provide us with the opportunity to scale up the project and expand through most areas of town, with a particular focus on residential neighbourhoods. Budgets, capacity and feedback would be continually considered to ensure that the project is in line with City goals and expectations of the Smart Cities funding requirements.

A more robust financial analysis will be linked to the updating of the City IT hub once recommendations brought forth by the IT Strategic Plan have been vetted by Administration and stakeholders.

As the City pushes the envelope for a more connected and innovated North, Administration will ensure that innovation and risk is balanced with financial accountabilty and continual verification to ensure that deliverables are relevant and that expectations are manageable.

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Breakdown of $250,000 Finalist Grant		
Design Charrette Facilitation and Expenses	$	42,055.15
Drafting of Final Proposal	$	75,000.00
Geofencing Pilot	$	10,350.00
Finalist Video	$	10,000.00
Jury Check-In (Toronto travel)	$	2,000.00
Lamppost Pilot	$	25,000.00
Engagement Misc. Cost (rental+food)	$	1,000.00
YKDFN partnership	$	25,000.00
Finalist In-Person and winner announcement	$	10,000.00
staff time	$	49,594.85
Total	**$**	**250,000.00**



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PROPOSED YELLOWKNIFE SMART CITIES BUDGET

Extraordinary Skies Action Plan	Year 1	Year 2	Year 3	Year 4	Year 5	Total $1,480,000
Lighting Plan for the City of Yellowknife Research, Design and Development of a Lighting Plan for the City of Yellowknife in partnership with local architects, designers and urban planners.	$125,000		$10,000		$10,000	$145,000
Light pollution baseline determination Assessment of current levels of light pollution based on available technologies, to be used as a baseline for the identification of quick turn-around deliverables, and for progress verification midway and at the end of the implementation plan.	$15,000		$10,000		$10,000	$35,000
Best Practices Guide for Dark Sky Compliance		$15,000				
Lighting retrofit and upgrades implementation Retrofitting and upgrading existing lamp posts in neighbourhood based on lighting strategy and evaluation of pilot project		$250,000	$350,000	$350,000	$350,000	$1,300,000
Information Technology Strategic Plan						**$1,345,000**
Information Technology Strategic Plan, policy development and two year check-ins	$75,000		$20,000		$20,000	$115,000
Privacy Impact Assessment		$50,000				
Information Hub technology improvements	$20,000	$60,000	$20,000		$20,000	$120,000
Capital Investment for IT Backhaul on municipal infrastructure		$250,000	$250,000			$500,000
Mesh Network lamppost technology installations			$50,000	$250,000	$250,000	$550,000
Geofencing and Beacon Technology Implementation		$25,000	$25,000	$25,000	$25,000	
WiFi hotspots	$40,000	$5,000	$5,000	$5,000	$5,000	$60,000
Electric Vehicle Penetration Action Plan						**$160,000**
EV Penetration Strategy Communications, partnership building and implementation plan design	$40,000					$40,000

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EV charging station installation equipment Capital investment for installation, operations and maintenance of electric vehicle charging stations and incentive tools as laid out in the EV Implementation Strategy Action Plan		$30,000	$30,000	$30,000	$30,000	$120,000
Ongoing Research and Engagement						**$1,225,000**
Baseline Progress Report of Sustainability Assessment of Yellowknife's performance on the UN SDGs, checkpoints and course correction reports	$50,000		$25,000		$25,000	$100,000
Research Budget Support third-party research to support Smart City Vision and IT Implementation Plan	$125,000	$125,000	$125,000	$125,000	$125,000	$625,000
Engagement Budget Implement Communications Plan and encourage engagement with targeted sectors	$100,000	$100,000	$100,000	$100,000	$100,000	$500,000
Operations & Maintenance						**$650,000**
Staff salary (1PY) for Smart Cities project management	$120,000	$125,000	$130,000	$135,000	$140,000	$650,000
	$710,000	$1,035,000	$1,150,000	$1,020,000	$1,110,000	$5,025,000

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CHAPTER 9

IMPLEMENTATION PHASE REQUIREMENTS

In this chapter the City of Yellowknife intends to show how it will meet requirements of applicable federal, territorial and municipal reporting and policy requirements.

DUTY TO CONSULT WITH INDIGENOUS GROUPS

The Duty to Consult with and accommodate Indigenous Peoples is required when the Crown contemplates actions or decisions that may impact treaty rights. Being a northern city with a close relationship with the Yellowknives Dene First Nation (YKDFN) with whom the City shares a border and with whom we count many shared citizens, it is critical that consultation and collaboration are consistent with the high ideals of both the Crown and the City.

To this end the City of Yellowknife is enthusiastic and proud to have YKDFN as partners in this project. YKDFN will participate in the governance of the project as part of the Smart City Committee and the community of N'dilo and Dettah will share opportunities to participate in the outcomes of the Smart City project.

The City has taken clear steps to include the YKDFN in the finalist stage of the proposal through the design charette and sharing the proposal for review with YKDFN. As a key partner YKDFN will play a key role in designing the strategies and outcomes as part of the Smart City Committee, and we anticipate showcasing YKDFN and Yellowknife history and culture in the engagement portion of the Smart Cities Implementation.

COMMUNITY EMPLOYMENT BENEFIT

Yellowknife's Smart Cities Challenge project intends to support employment opportunities for youth, Indigenous elders, artists, recent immigrants, youth and small-sized and medium-sized businesses and social enterprises. By having targeted workshops, technology based challenges, projects and contracts through the research and engagement budget, it is hoped that creative tools and engagement opportunities will encourage participation of targeted groups to build excitement and opportunities for inclusion into a Smart City. Participation will be tracked and specific engagement sessions and opportunities will be included .

Putting in place the conditions for innovation to flourish will allow for a rise in circular economy, green jobs and social innovation to take place. Turning Yellowknife into the Tourism Capital of the North will benefit all of Yellowknife and YKDFN, and the City will promote opportunities for cultural tourism. Yellowknife as a northern hub for innovation and a Smart City will set about the groundwork for a surge in small scale entrepreneurship, innovation and the knowledge economy.

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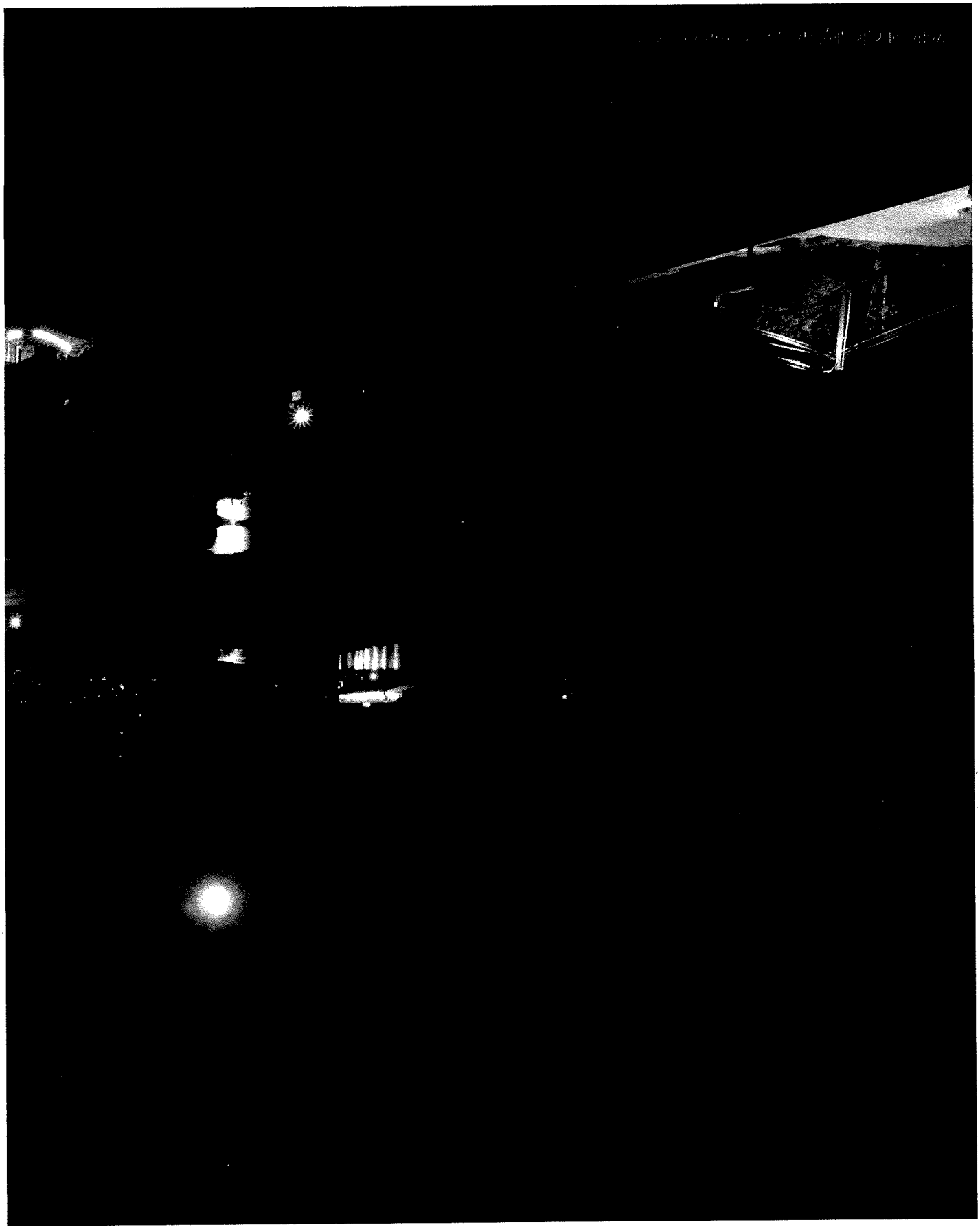
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• EXTRAORDINARY •

YELLOWKNIFE

SMART CITIES PROPOSAL

Infrastructure Canada's Smart Cities Challenge



FINAL PROPOSAL

MARCH 5, 2019

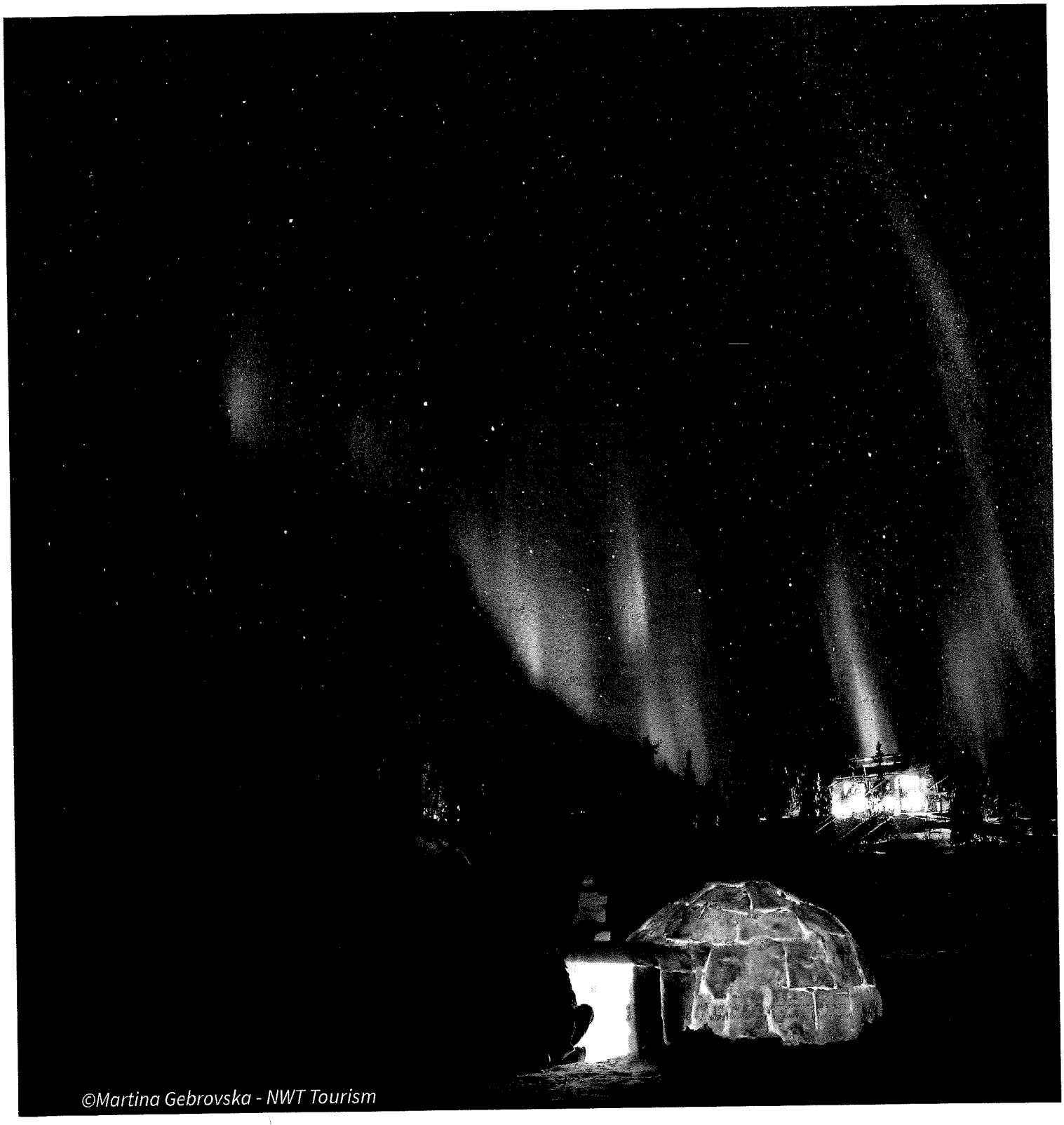
CITY OF YELLOWKNIFE

ECOLOGY NORTH

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Northland Utilities
An ATCO and Fortis Company

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An igloo beneath the Aurora Borealis, outside of Yellowknife NT

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Participants of the 2018 2-Day Design Retreat for the Smart Cities Challenge in Yellowknife

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EXECUTIVE SUMMARY

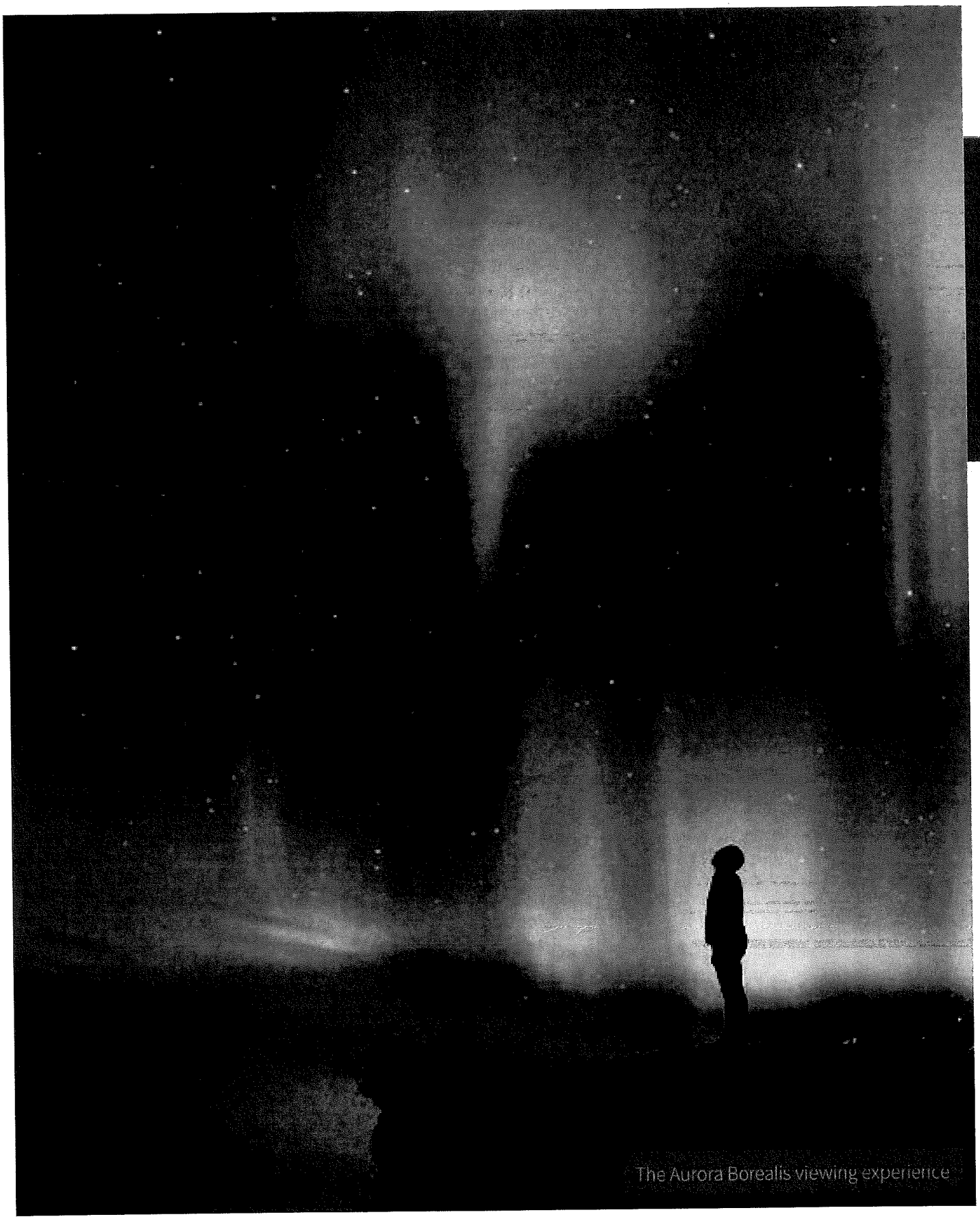
Yellowknife is a place where ambition and ideas can easily turn into reality. It is a small, tightly knit, vibrant community with strong leadership and a desire to foster innovation. The Smart Cities Challenge has engaged the City to envision a future where technology is a key part of everyday life and the design and control of that technology is controlled by clear policy for the benefit of all Yellowknifers.

The City of Yellowknife has done considerable community engagement to understand what a Smart City might mean in the northern context and how it will improve the lives of its residents. The focus of this proposal is on five key impacts: extraordinary skies, tourism, a replicable framework for northern innovation, community connectivity and sustainability. To achieve these impacts there are a series of outcomes that will be attained through the diverse technological innovations to be incorporated into the lampposts much like apps to a smartphone.

These technologies will all be vetted through new strategic thinking that will learn from the best of European and North American Smart City experience to help nurture a Northern Smart City ethos. By pitching Yellowknife as a cold weather lab for smart city innovation, the City will develop replicable plans, tools and ideas that can be spread throughout the north. The focus on dark skies and light pollution reduction will set the City apart in the competitive world of aurora tourism, and provide economic development opportunities and benefits for Yellowknifers. Electric vehicles, improved city services, beacon and geofencing technology and a mesh network will be some of the tools that help the City meet its ambitions of a smart outpost in the boreal forest.

This proposal outlines how the City proposes to take a measured and reasonable approach to reach the stated outcomes that will define success. The Smart Cities Challenge will be the springboard that turns the simple lamppost into a beacon for sustainability.

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CHAPTER 1

VISION

Challenge Statement

Yellowknife will experience a rise in our community's social and environmental well-being by transforming the simple lamppost into a beacon for sustainability.

The City of Yelllowknife's Smart Cities Challenge Statement is ambitious and summons stakeholders to explore the complexities of evolving into a Northern Smart City. In the past year, our efforts towards engagement and research have cemented the importance of using information and technology to better the lives of Yellowknifers. We are excited about this opportunity to use the Smart Cities Challenge as a springboard to make Yellowknife a place that defines itself differently: a place in which knowledge, information and Smart City technology become central to our identity as a cold-weather urban laboratory surrounded by the beauty and vastness of the boreal forest.

There is considerable work ahead before we achieve this ideal, but the pieces are in place, and we have confidence in our staff, our leadership, and in the passionate and engaged population of the City of Yellowknife.

BUILT ON GOLD, NURTURED BY GOVERNMENT, LIT BY TOURISM AND LOOKING TO TECHNOLOGY

Yellowknife, "where the gold is paved with streets", or Sambaa K'e "the Money Place" in the local Wilideh language, has a fascinating if relatively recent history as a city. Prominently located on the shores of Great Slave Lake, The Yellowknives Dene First Nation have traditionally occupied the region. The location was a rich fishing and hunting ground for the Dene People. The 1930s gold rush lead to the rapid influx of prospectors—complete with vehicles, floatplanes and all the latest and greatest technologies of the time. Yellowknife boomed with the development of two huge gold mines that spread along the shores. In time the city grew and developed a new downtown, became the administrative centre of the Northwest Territories (NWT), and eventually the capital city in 1967.

Growth continued in the 1970s and 80s, following the cycles of boom and bust that accompany the mining sector. The eventual decline and closure of both Con and Giant mines impaired the city's economy, until diamonds came to the rescue and led to a second mining boom in the 1990s. The Government of the Northwest Territories (GNWT) signed a devolution agreement in 2013, setting the stage for government to take a larger role in the economy. Meanwhile, the city core that grew so rapidly in the 1950s and 60s started to show its age, and social problems became more apparent. As the current diamond mines move towards the end of their lifespans, the tourism market, in particular aurora tourism, has emerged as a potential area of economic growth.

Meanwhile, treaties with indigenous governments in the Territories are being settled, or are in the process—which may bring about more opportunities for revitalization and growth led by indigenous governments. This evolution of opportunities (and challenges) isn't unique to Yellowknife alone, but forces us to look to our changing horizon for the next chance to redefine our city, carved out of the boreal forest on the shores of Great Slave Lake.

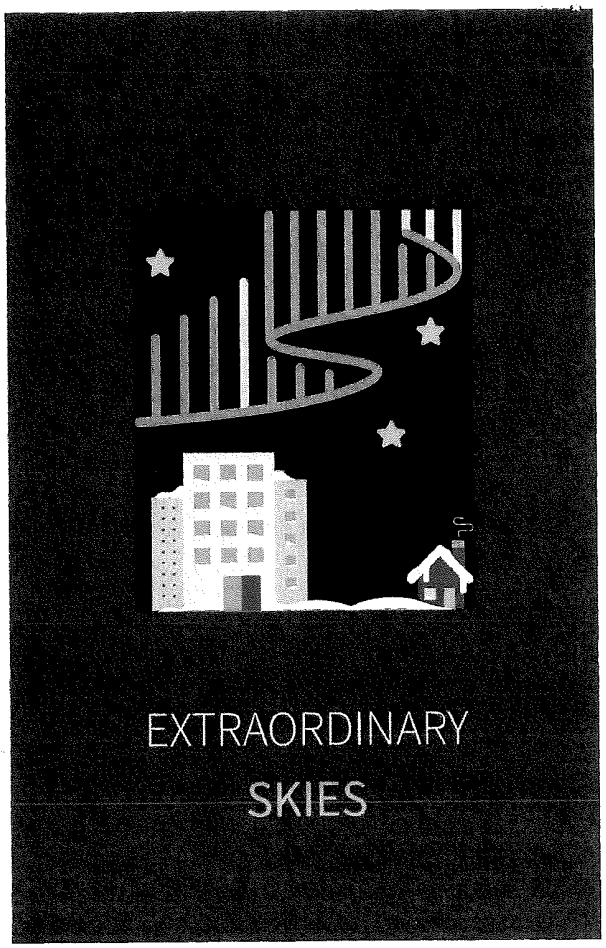
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IMPACT A: EXTRAORDINARY SKIES

As often happens with shared resources, the night sky viewing experience has been slowly degraded. The pervasive creep of light pollution has been hastened by technology and the energy saving promise of LED lighting. We know that early adopters often learn key lessons about the adverse side effects of technology, but they also benefit longer, and are able to capitalize on future opportunities. As a leader and early adopter of a Smart City mentality, we propose to use our experience to document and outline the challenges and problems we encounter to guide others down the road of advanced technology.

We see the Smart Cities Challenge as our avenue to support other similar-sized cities around Canada, particularly the small towns scattered throughout Canada's North. By implementing a strategic lighting plan alongside interconnected lampposts, and encouraging light reductions city-wide, Yellowknife will lead by example in an area of growing importance. The next step for city lighting is to implement technology that dims and brightens lights at appropriate times. The technology is becoming available to take this city-wide and beyond.

Opening up our skyline to expose the aurora will have multiple benefits for Yellowknifers on top of the economic drivers of tourism. We will become more in tune with the sky and connected with the dancing lights. Decreasing the unnecessary presence of street lighting will allow natural lighting patterns to influence our moods and circadian rhythms without artificial influence. We intend to make the most of this opportunity to not only test the technology, but evaluate and communicate the softer benefits of improved lighting outcomes for human health, community and happiness.

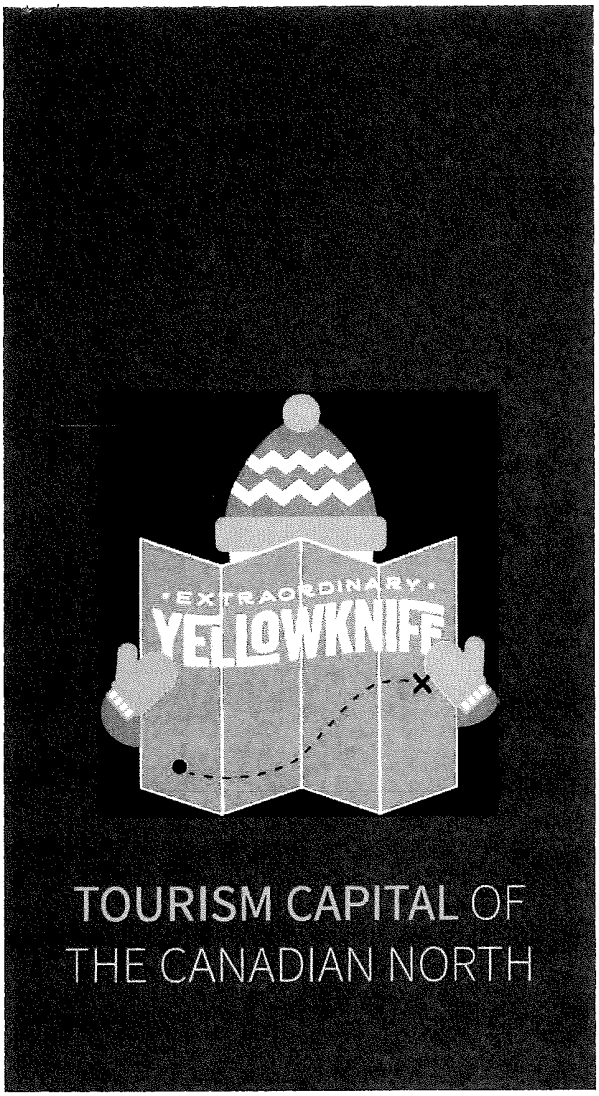


QUOTE

"The Northwest Territories has much to offer travellers – stunning landscapes, rich culture and unforgettable adventure. It also has much to gain. Tourism 2020 is an investment in our people, our communities and our future. This renewable resource has a high return on investment and will create lasting economic opportunities, careers and capacity building throughout the territory."

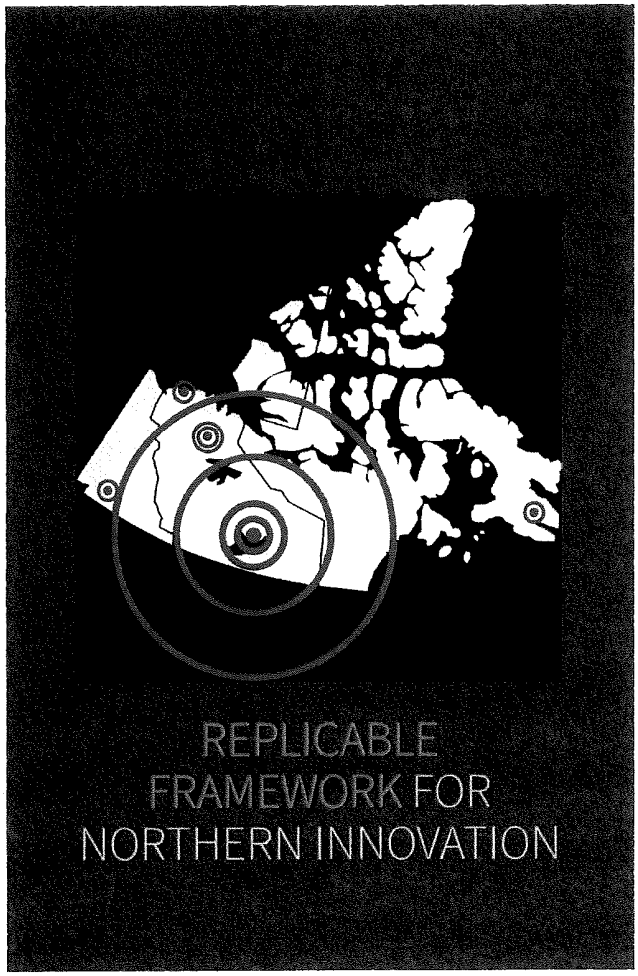
– Wally Schumann,
Minister of Industry,
Tourism and Investment

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IMPACT B: TOURISM CAPITAL OF THE CANADIAN NORTH

The Smart Cities Challenge will amplify existing efforts to develop our natural tourism resource of "Extraordinary Skies". In 2017-18 over 34,900 tourists travelled to Yellowknife to view the Aurora Borealis or northern lights (GNWT, 2018) . Tourism employs over 12% of NWT residents, with a spinoff effect estimated at $3.80 for every $1 spent (NWT tourism, 2016). The Government of the Northwest Territories (GNWT) expects 35% growth in the industry increasing visitor spending to $235 million by 2020 (GNWT, 2016). Yellowknife happens to be ideally situated under the auroral belt, has clear skies and is regarded by many as the best place in the world to view the northern lights.



IMPACT C: REPLICABLE FRAMEWORK FOR NORTHERN INNOVATION

Yellowknife has the potential to become a place where knowledge and technology combine to carve out a sector of the economy that is defined by our natural and cultivated assets. The city will evolve into an experimental hub of technology and a place of new, innovative enterprise.

The foremost factor encouraging this transformation is the people. Northerners are well known for their resilience, strength of character and resourcefulness, but also for their adaptability and openness to change. Yellowknifers are young and well-educated, having near the highest per capita post-secondary degrees in Canada (McGrath, 2013), and is increasingly multicultural. This unique blend of intellect, diversity, creativity, and youthful vigour, when combined with the knowledge and resilience of our First Nations partners, makes our population a perfect place to build a Smart City.

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We view this opportunity as a springboard to build a sustainable model for economic development built on tourism, research, and innovation. Yellowknife's relatively small size makes the City agile. Its location at the end of the highway, in the midst of a cold and harsh climate, makes the city an ideal laboratory for innovation, cold-weather testing and information technology. We see a future pitch from our new smart-city-endorsed label: "tested in Yellowknife".

The final factor is our politics. We are home to a strong base of democratic idealism, a consensus government that isn't subject to partisanship, and a flair for pushing the envelope. A strong civil society is another feather in our cap, and being a small jurisdiction, our partnerships and engagement are based on human relationships—like the comfort that comes from meeting your elected officials in the grocery store checkout line. The key to our continued evolution into a smart city will be engagement with the population, and particularly our First Nations partners and neighbours. We will develop a new story for a diverse and prosperous Yellowknife centered around technology, innovation and resilience.

IMPACT D: COMMUNITY CONNECTIVITY

Our research has shown that having a clear framework for technology adoption and decision-making is key to making a Smart City. Establishing policies, targets, and strategies into a Smart Cities framework will make the ground rules clear, structure our decisions on technology, and evaluate and measure success. In cities like Barcelona, Glasgow and Copenhagen, these frameworks are already well-advanced; these European case studies can serve as models for our own Smart City Vision. White Arkitekter, the largest architecture firm in Scandinavia and a global leader in sustainability, have been a key stakeholder since the beginning to bring European best practices and experience straight to the Canadian North. Carleton University's Urban Research Lab has helped to understand the North American experience with Smart Cities and urban context, while our very own local environmental champion Ecology North has helped the City bring these pieces together in a coherent manner.

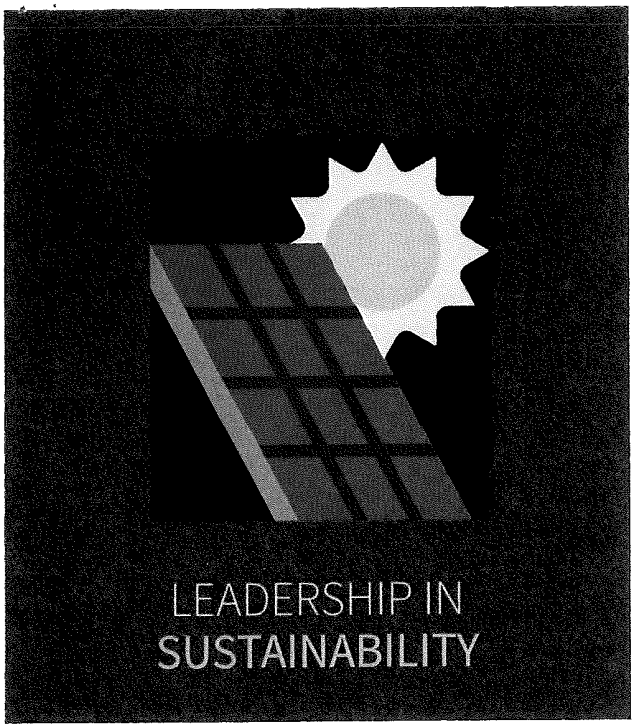


Venturing into the realm of Smart Cities is unchartered territory for the stakeholders. We look forward to an iterative process that includes the necessary checkpoints and protocols to ensure that the project moves forward in a meaningful and manageable manner. Already, the Smart Cities process has sown seeds across city departments on how to improve municipal servics through integrated technology.

One of the key components of our journey will be to develop an Information Technologies Smart Cities Strategic Plan: which will guide our outlook on Information Technology, and create a framework for making decisions around information moving forward. This framework will be based on the experiences of those who have gone before us, but be scaled and adapted to our unique Northern circumstances.

A key part of our transformation will be continuous engagement with Yellowknife citizens. Open data sharing and knowledge transfer will also help the City gain social licence and trust, build partnerships, and leverage funding and ideas. Using the ubiquitous lamppost as a beacon for sustainability, we will create distinct and unique opportunities for citizen and stakeholder engagement within a Smart Cities construct.

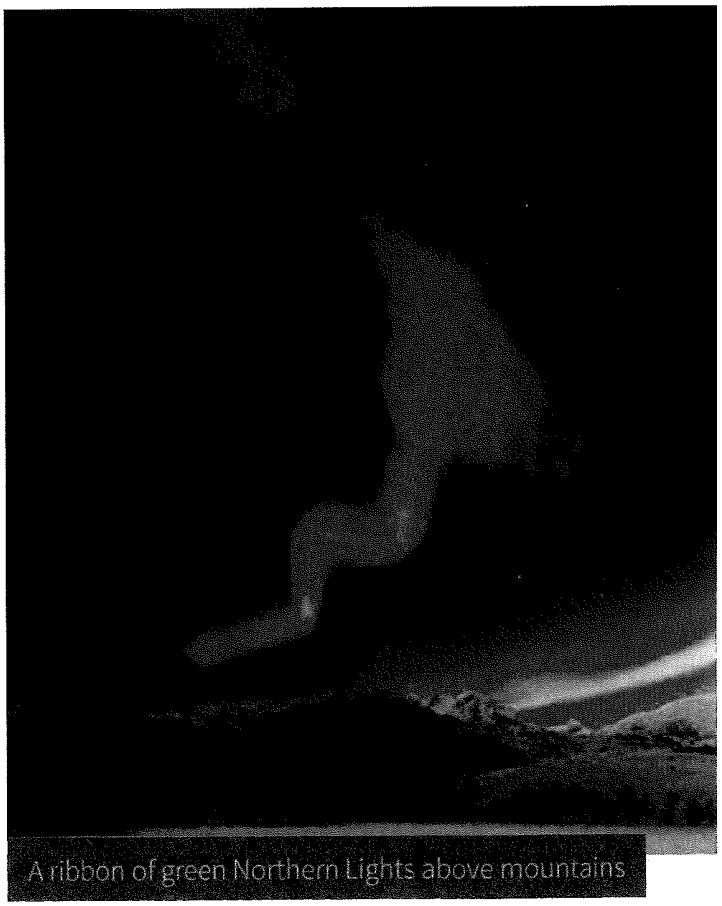
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IMPACT E: LEADERSHIP IN SUSTAINABILITY

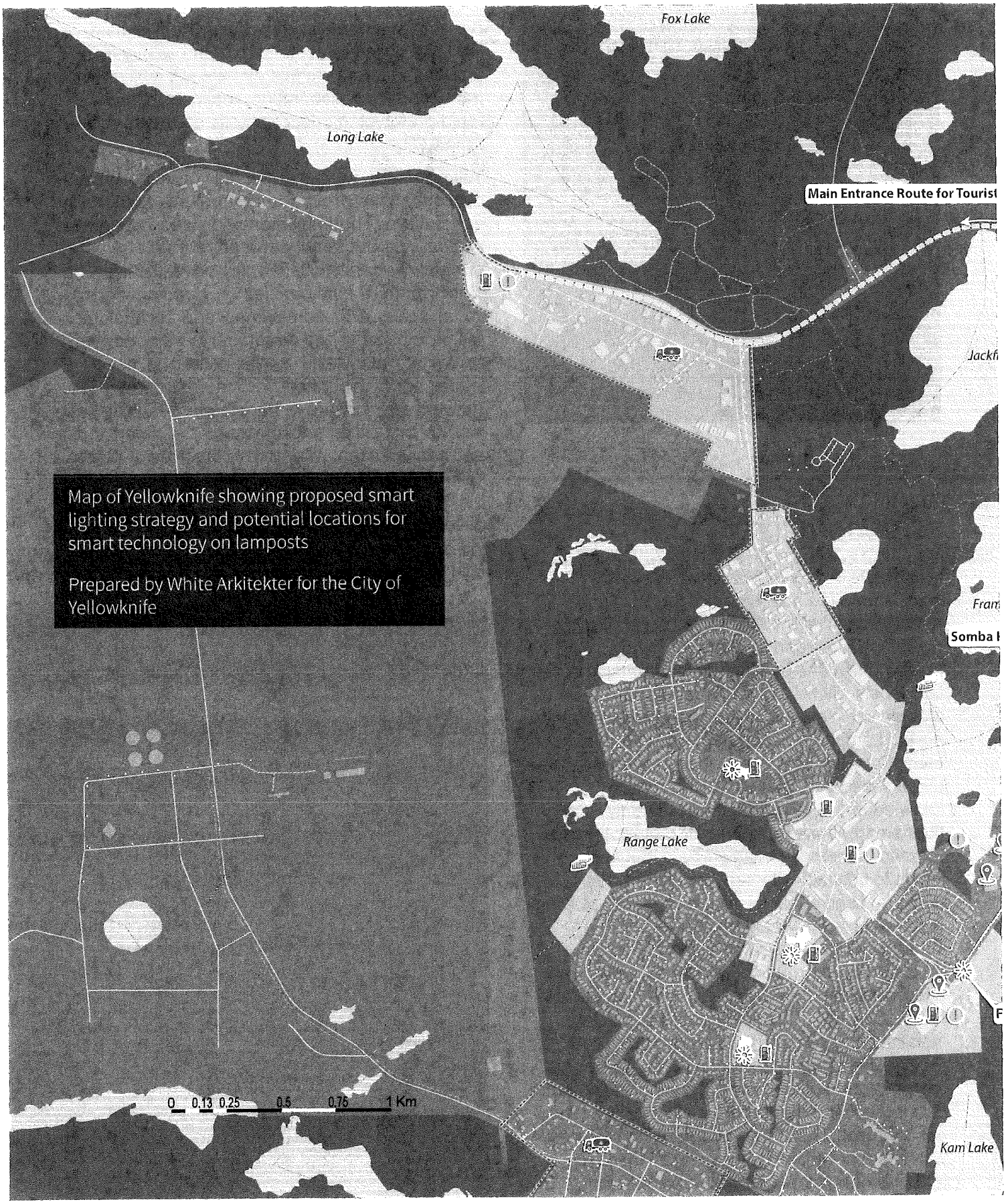
Meanwhile Yellowknifers and tourists will benefit from the adaptation of the lamppost to pose innovative solutions, as suggested by the city's residents. Electric Vehicle (EV) charging stations built right into streetside lampposts will help to encourage adoption of electric vehicles, and prove that they work in the north. Lamppost-based geofencing and beacon technology will help make interpretive materials, event schedules, maps and community knowledge available to tourists, directly through their smart phones and in their mother tongue. Expanded free Wi-Fi would help tourists and locals to connect with services, information, maps and social media. Meanwhile, the majority of city lampposts would be connected to a series of 22 gateways that will move internet protocol (IP) information back to City Hall, and underpin a mesh network and new information hub at City Hall. This network will enable the installation of sensors that can reduce costs for City and other services: such as water and sewer infrastructure, waste, transportation, and data collection on permafrost, climate, and the environment. These improvements in services will help reduce energy and electricity costs and greenhouse gas emissions, improving our already impressive track record of climate leadership and citizenship to promote buy-in and engagement. To this aim we will cultivate transparency, collaboration, replicability and rapid prototyping in our process of becoming a Smart City.

Yellowknife's northern setting creates unique circumstances around infrastructure, resources, and culture. The implementation of a connected network via the lamppost feature in this remote, climatically-harsh location will pave the way for other northern communities on a regional or national scale. Our frameworks and technologies will be replicable and adaptable to other northern contexts. Yellowknife is well-poised to act as a leader and a laboratory for innovative practices. As we move forward in transforming our City, we look to our citizens to embrace the smart tools and networks that will improve the lives of Yellowknifers. The Smart Cities Challenge is an opportunity to build a sustainable model for economic development based on tourism, technology and the potential for Yellowknife to act as an open-air cold weather lab.



A ribbon of green Northern Lights above mountains

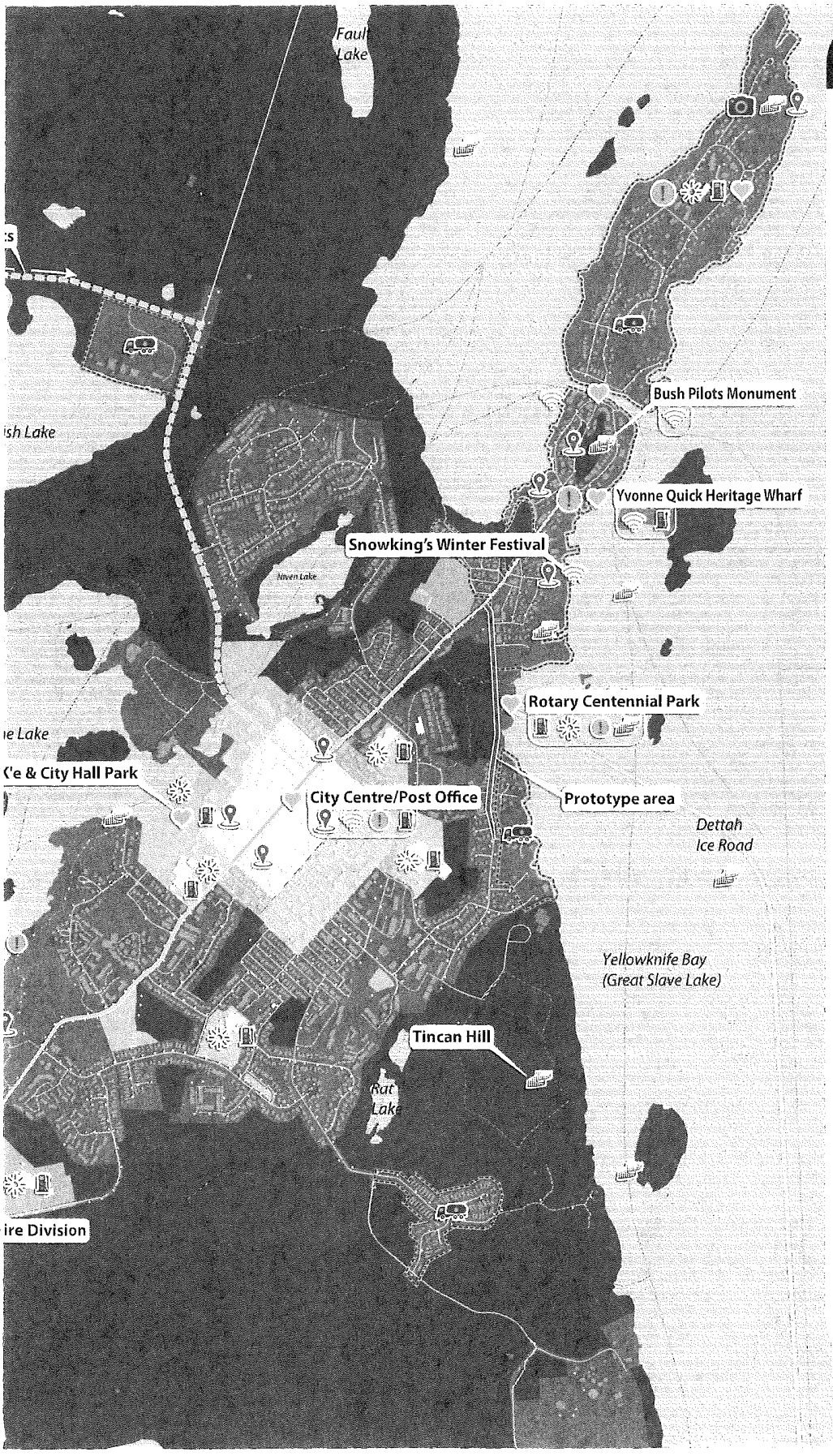
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Map of Yellowknife showing proposed smart lighting strategy and potential locations for smart technology on lamposts

Prepared by White Arkitekter for the City of Yellowknife

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EXTRAORDINARY YELLOWKNIFE STRATEGY MAP

BEACON OF SUSTAINABILITY

At these points of interest the light poles can be given a more striking visual dimension, clearly stating their importance and contribution to Yellowknife's work towards a more sustainable society.

AURORA VIEWING SPOTS

Potential Smart Tech Integrated with Light pole

MUNICIPAL WIRELESS

PANIC BUTTON

GEOFENCING & BEACON AREA

AURORA SELFIE CAMERA

LIGHT SIGNALS

Warns for thin ice along shores or speed limits when in proximity to schools. Close to the fire division they can also signal in case of emergency.

EV-CHARGING STATION

TRUCKED WATER AREA

PRIMARY ROAD

PROTOTYPE AREA

Motion dimmable light

Lighting Priority Zones

LPZ0 - HIGH

Wilderness areas, parks and preserves, and undeveloped rural areas. Includes protected wildlife areas and corridors.

PZ1 - MEDIUM

Wilderness areas, parks and preserves, and undeveloped rural areas. Includes protected wildlife areas and corridors.

LPZ2 - LOW

Light commercial business and industrial districts, high density or mixed used residential districts.

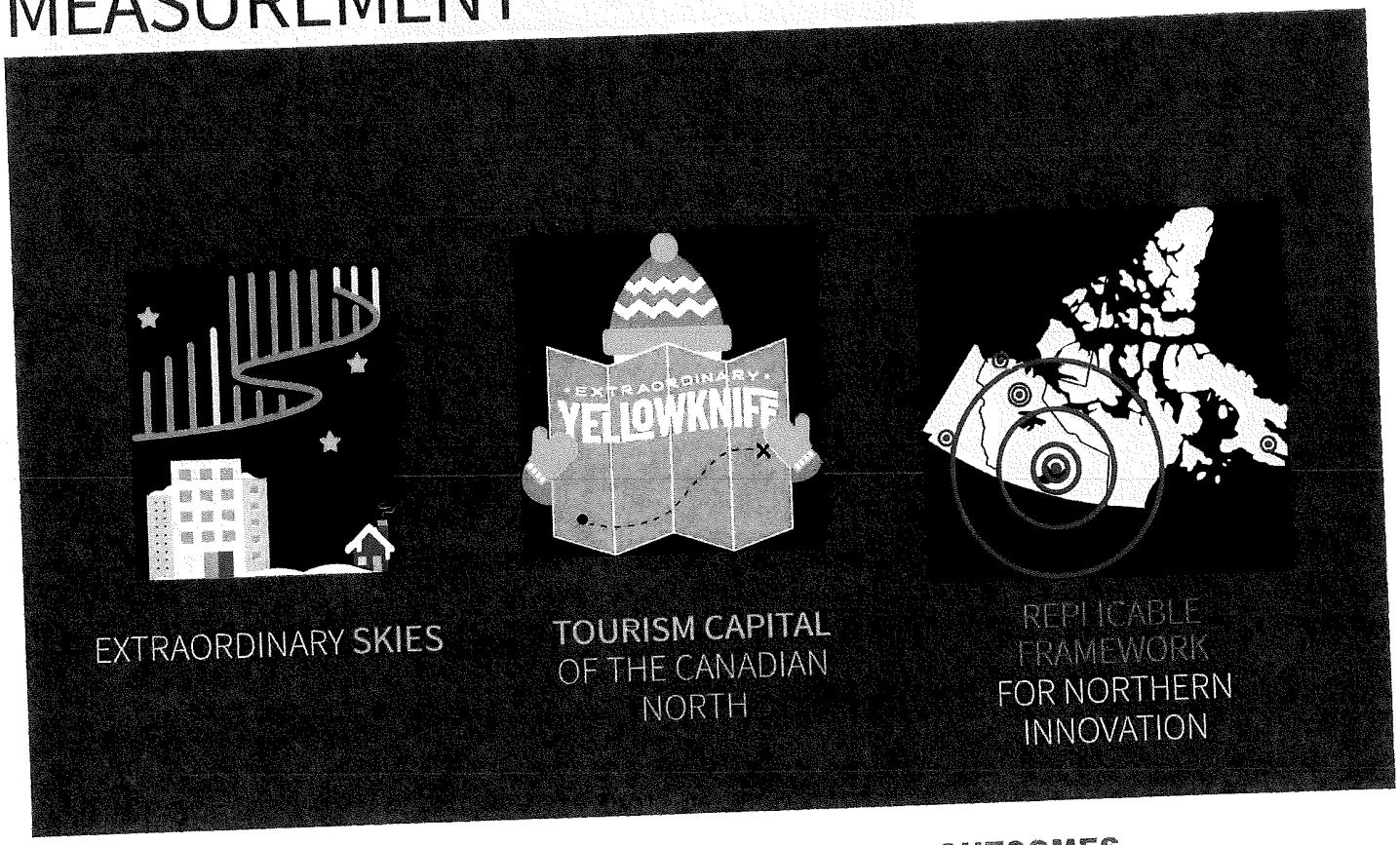
LPZ3 - LOWEST

Large cities' business district, commercial corridors, town centers heavy in dustrial zones.

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CHAPTER 2

PERFORMANCE MEASUREMENT



OUTCOMES

A.1 Increase in Dark-Sky Friendly Neighbourhood trends

A.2 Decrease in sky glow (light pollution) based on 2019 levels

A.3 Increase in public awareness about effects of light pollution

OUTCOMES

B.1 Increase in tourism

B.2 Increase in quality of Aurora Borealis viewing experiences

B.3 Increase in location-tagging and tourism hashtags

B.4 Increase in use of Ping Street app

B.5 Sustainable economic diversification and income to local tourism-based businesses

OUTCOMES

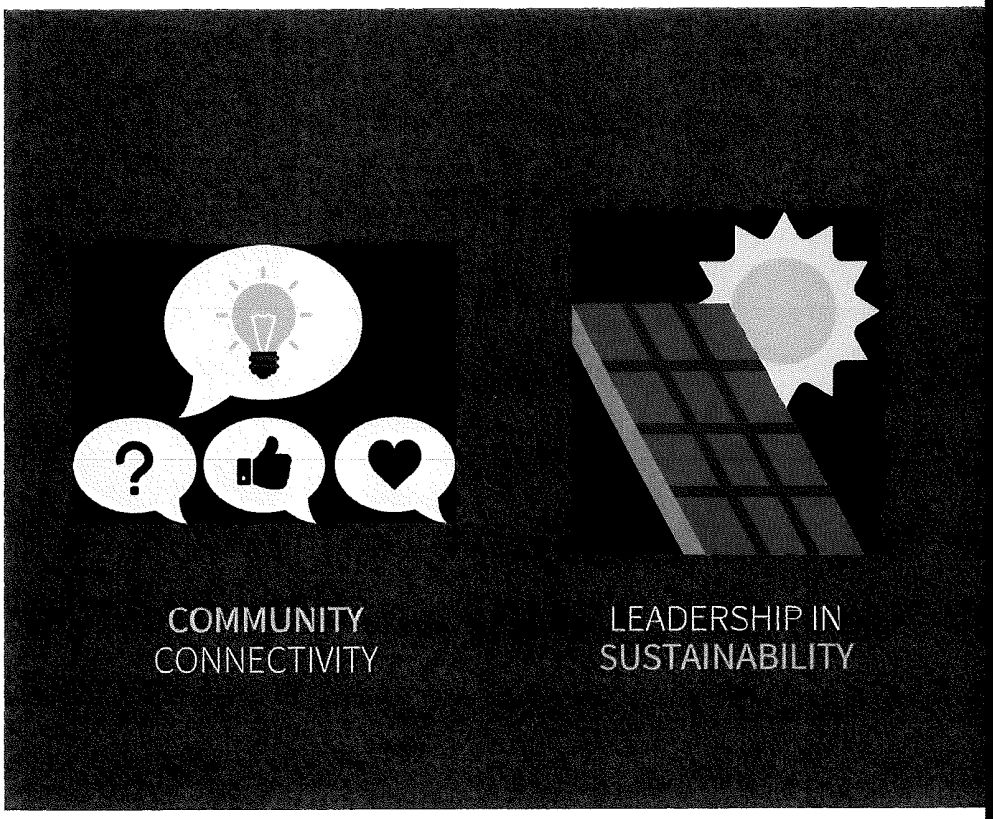
C.1 Finalized, scalable and shareable IT strategy for northern municipalities

C.2 Outputs consistent with Smart City Vision at 3 & 5 year Checkpoints

C.3 Participation by external contractors in developing applications for Yellowknife IoT infrastructure

C.4 Reduction in cost and increase in reach of municipal services

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COMMUNITY CONNECTIVITY

LEADERSHIP IN SUSTAINABILITY

OUTCOMES

D.1 Increase in local expertise and literacy regarding smart cities technology

D.2 Increase in engagement on Placespeak

D.3 Increase in real-time information being updated in the Pingstreet App

D.4 Increase in broadcasting impact and reach

OUTCOMES

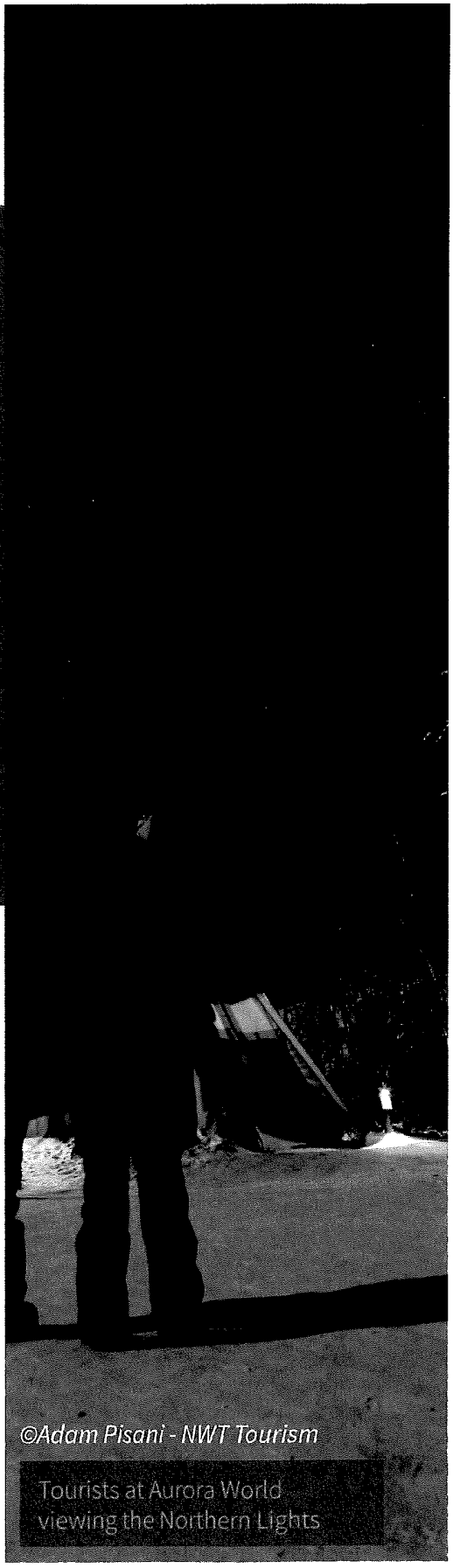
E.1 Yellowknife will lead the North in Electric Vehicle penetration

E.2 Make progress toward the targets set in Yellowknife's Corporate and Community Energy Plan

E.3 Reduction in electricity use from dimmable streetlights

E.4 Reduction in water and energy use and carbon emissions from improved city services

E.5 Progress toward achieving United Nations Sustainable Development Goals



©Adam Pisani - NWT Tourism

Tourists at Aurora World viewing the Northern Lights

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CHAPTER 2

PERFORMANCE MEASUREMENT

INPUTS

resources. time. capital.

ACTIVITIES

on-the-ground. planning.

application phase

open house 60 visitors

3-day design charrette

40 participants

19 prototype suggestions

R&D, strategic planning

~20 group meetings

~60 informal meetings

advocacy

pitch to City Admin

pitch to City Council

proposal writing

public open house

feedback integration

finalist phase

$250k

feasibility study

selection of prototypes: adaptive lighting; EV charging; geofencing; WiFi; utilities monitoring

"Dark Skies" public event

Infrastructure Canada participation

initial prototyping phase

design procurement shipping installation

monitoring & reporting

prototype installation

launch events

public engagement web platform development

prototype monitoring

effectiveness

public response

strategic forecast

results analysis

financial forecasting

drafting work plan

$5M

Smart City Prizewinner Phase

development of strategic frameworks

baseline development for all strategies

best practices framework for City IT infrastructure

Extraordinary Yellowknife Lighting Strategy

implementation

engagement with utilities contractors

selection of vendors & contractors

design procurement hardware installation

operations & maintenance

update training & resources for employees

continuous feedback & improvement

monitoring & reporting

engagement & feedback

baseline determination, consumption & usage tracking

communications & engagement

OUTPUTS

deliverables.

OPEN SOURCE FRAMEWORKS

CITY-WIDE MESH NETWORK

DATA INTERACTION SENSORS

LIGHT POLLUTION REDUCTION TECH

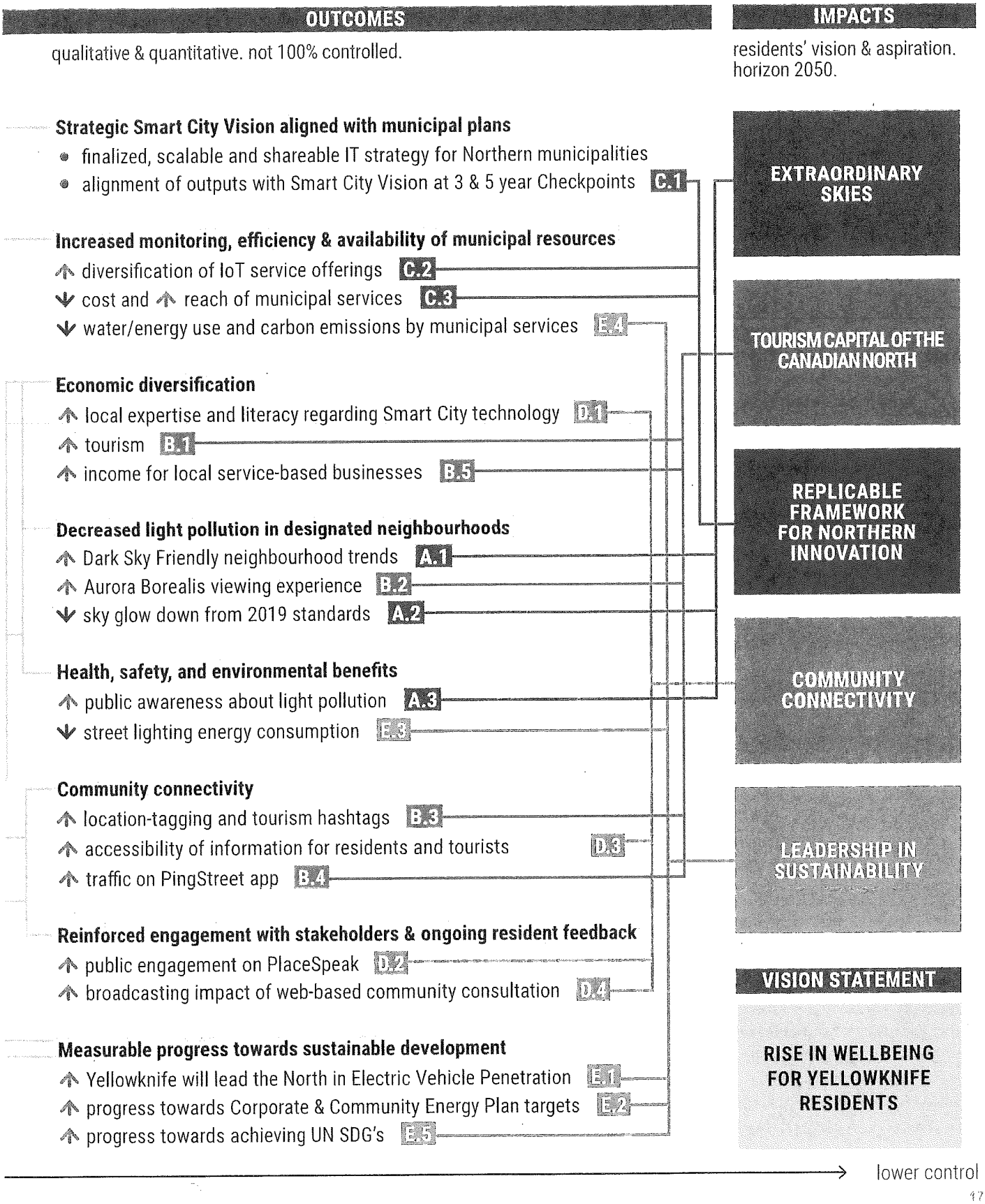
GEOFENCING & BEACON TECH

MUNICIPAL WIRELESS

ELECTRIC VEHICLE CHARGING STATIONS

higher control

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CHAPTER 2

PERFORMANCE MEASUREMENT

Measuring success against quantitative and qualitative performance indicators is a key part of Yellowknife's Smart City Plan as highlighted in this proposal. The chart on the previous page summarizes this proposal in five columns that help explain the journey to become a Smart City. The **inputs** tell the story, while **activities** summarize the proposed plan, and the final column, **Impacts**, summarizes the vision. The **outputs** column highlights the deliverables and technologies, while the **outcomes** are the key to performance management. Striving to achieve the impacts and fulfill the vision will be an iterative journey. This journey will recognize a considerable number of actionable variables that must be addressed in order to reach the measurable outcomes.

MEASURING PERFORMANCE

To build consensus, understanding and consistency around a Smart Cities framework, Yellowknife will consider following the International Organization for Standardization Certification ISO 37106:2018 for Sustainable Cities and Communities. This document gives guidance for leaders in cities and communities on how to develop an open, collaborative, citizen-centric and digitally-enabled operating model for their city that puts the vision for a sustainable future into operation (ISO, 2018).

As the basis for a new Smart City Yellowknife vision, the ISO standard will enable processes for the innovative use of technology and data. It will ensure that the City is working within a consistent and globally accepted framework for sustainable cities. Further to this the City will initiate a series of strategies and action plans that will provide a framework to reach the stated impacts. This chapter will highlight the five impact streams that the City has identified to help reach the vision, the outputs which are the plans to get there, and the outcomes that will allow for performance measurement.

IMPACT STREAM A: EXTRAORDINARY SKIES

Yellowknife will maintain its reputation as the the most attractive aurora borealis tourism destination in Canada by focusing on the reduction of light pollution using dark sky principles and a city-wide Lighting Strategy. Putting in place the conditions necessary to achieve Extraordinary Skies starts with a progressive transition to embracing Extraordinary Yellowknife (output A.2). The municipality will slowly phase out lights that are not compliant with the concept of Dark Sky municipalities. Most of the long-term impacts are outside the timeframe of this Smart Cities Challenge, and should be visible over the course of the next 10 years. However, it is anticipated that the implementation of new lighting will have an immediate, noticeable impact on light pollution.

Output A.1 Light pollution baseline in Yellowknife

Output A.2 Development of "Extraordinary Yellowknife" Lighting Strategy to guide municipal retrofit lighting plan

Output A.3 Best practices guide for dark skies compliance

Output A.4 Transitioning of select Yellowknife streetlights to smart lighting technology, in alignment with the Lighting Strategy

Output A.5 Retrofitting of select Yellowknife neighbourhoods into Dark Sky compliant areas

The determination of the current light pollution baseline (output A.1) will show the potential for what is yet to come. Using the latest technology, the Yellowknife Smart Cities Challenge team will measure the current light pollution levels in the City. It has not been decided yet what tool will be used, nor if the light pollution illuminance in the covered or starry sky will be measured. Additional

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work is underway to determine the best technique that will not provide erroneous results because of changing weather conditions.

The City will evaluate the effectiveness of the motion sensing dimmable light pilot project on School Draw Avenue with regard to energy savings, functionality, safety, security, light pollution reduction and citizen approval. The City and partners will identify appropriate improvements and a plan to expand to lighting retrofits and city wide lighting improvements strategically (output A.4).

As part of a city-wide expansion of dark sky compliance, the City will continue to work toward reductions of unnecessary lighting and improving awareness about the effects of light pollution. This output will be no additional cost for Yellowknife residents as it does not force an immediate retrofit, but rather a long-term change in mentalities. Local retailers will be moving towards Dark Sky friendly lighting fixtures. There is no requirement, but built in incentives and awareness of benefits to encourage homeowners and businesses to change the existing non-compliant lighting fixtures.

Outcome A.1 Increase in Dark-Sky Friendly Neighbourhood trends

Outcome A.2 Decrease in sky glow (light pollution) based on 2019 levels

Outcome A.3 Increase in public awareness about impacts of light pollution

As the centerpiece of Yellowknife's Smart Cities experience, the City will experience a reduction in light pollution, better aurora viewing outcomes and a closer connection with our extraordinary skies. Learning from the pilot project on School Draw Avenue will assist the City as it expects to expand dimmable lighting throughout half of the city within five years. All of this will be done with guidance from the Yellowknife Lighting Strategy once approved by Council. A strategy will also be set for how to start a public awareness campaign to educate and encourage residents and businesses to reduce private lighting and to encourage dark sky compliant fixtures. Efforts will also be made toward strengthening partnerships in order to understand and study the impacts of LED lighting on human health and wildlife.

As motion sensing dimmable lighting is a relatively recent technology there are risks for early adoption. The City intends to work closely with industry and partners to ensure lessons are learned from the pilot project, and that residents understand and are excited about the prospects of dimmable lighting. The biggest risk factor is the potential for perceived safety risks to negatively impact the public appetite for dimmable lights. To mitigate this risk the City will research and communicate the safety and health benefits of motion-sensing dimmable lighting to the people of Yellowknife.

IMPACT STREAM B: TOURISM CAPITAL OF THE CANADIAN NORTH

Yellowknife is happy to be a market leader as a northern tourist hotspot. To maintain and improve this status will require considerable effort in many areas, including efforts to use technology to improve the experience of tourists. This will be done by using smart lighting to better showcase our extraordinary skies (output B.1). Improving tourism products and services while catering to a new brand of Smart City tourism that has the potential to create sustainable economic diversification and provide income to local tourism-based businesses.

Output B.1 Promotion of Extraordinary Skies for tourism (in parallel with outputs A.2 to A.5)

Output B.2 Work with partners to increase availability of resources and information to tourists, using both digital and traditional platforms

Output B.3 Expansion of geofencing infrastructure

Output B.4 Development and installation of beacon technology

Output B.5 Expansion of existing free municipal wireless network

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Outcome B.1 Increase in tourism

Outcome B.2 Increase in quality of Aurora Borealis viewing experiences

Outcome B.3 Increase in location-tagging and tourism hashtags

Outcome B.4 Increase in use of PingStreet app

Outcome B.5 Sustainable economic diversification and income to local tourism businesses

Taking pride in our Extraordinary skies and improving night sky viewing opportunities for tourists will be a key part of the Smart Cities plan. This will be easily tracked by economic indicators that the Government of NWT compiles around tourism, and also adoption and use of apps, social media and beacon technology. But the full story of how a Smart City focus improves the tourism experience will be found in qualitative experience of the tourists itself. To that end the City will continue to work with partners at NWT tourism, the future Yellowknife destination marketing board, and tourism industry providers.

There are global and national issues that pose a risk to tourism in Yellowknife. These are beyond the control of the City, but by improving the experience of tourist through tourism and a Smart City experience that risk will be substantially mitigated.

IMPACT STREAM C: REPLICABLE FRAMEWORK FOR NORTHERN INNOVATION

Developing a clear strategy for making Yellowknife a smart city, as well as an open transparent cold-weather laboratory for smart cities technology, are both key aspects of this plan. Being the hub for the North, Yellowknife also wants to document and communicate successes and failures to help other similar-sized northern communities adopt smart practices, policies and technology that make sense in our harsh climate. The City intends to do this through the following five outputs, measurable by the subsequent outcomes.

Output C.1 Adoption of ISO 37101:2016 Sustainable Cities and Communities

Output C.2 Commissioning of Smart Cities IT strategy and action plan

Output C.3 Creation of Smart City Committee to oversee the integration of Smart Cities vision into municipal services and infrastructure

Output C.4 Expansion of municipally-owned Internet of Things (IoT) infrastructure

Output C.5 Improvement of City Information Hub, backhaul infrastructure and lamppost mesh network.

Output C.6 Development of Engagement Plan, including incentivization plan and protocol for third party participation

Output C.7 Creation of research budget to incentivize entrepreneurial Smart Cities innovation in a northern setting

Outcome C.1 Finalized, scalable and shareable IT strategy for northern municipalities

Outcome C.2 Technology-related outputs consistent with Smart City Vision at 3 & 5 year Checkpoints

Outcome C.3 Measurable improvement in developing applications for Yellowknife IoT infrastructure

Outcome C.4 Reduction in cost and increase in efficiency of municipal services

Key outcomes will be achieved following the development of strategic plans, and the subsequent improvement of the IT strategy and system. This will help turn Yellowknife into a centre where IT and information generated by smart data become key factors in municipal strategic planning, and smart technology solutions are increasingly adopted by the public, society groups, and the private sector.

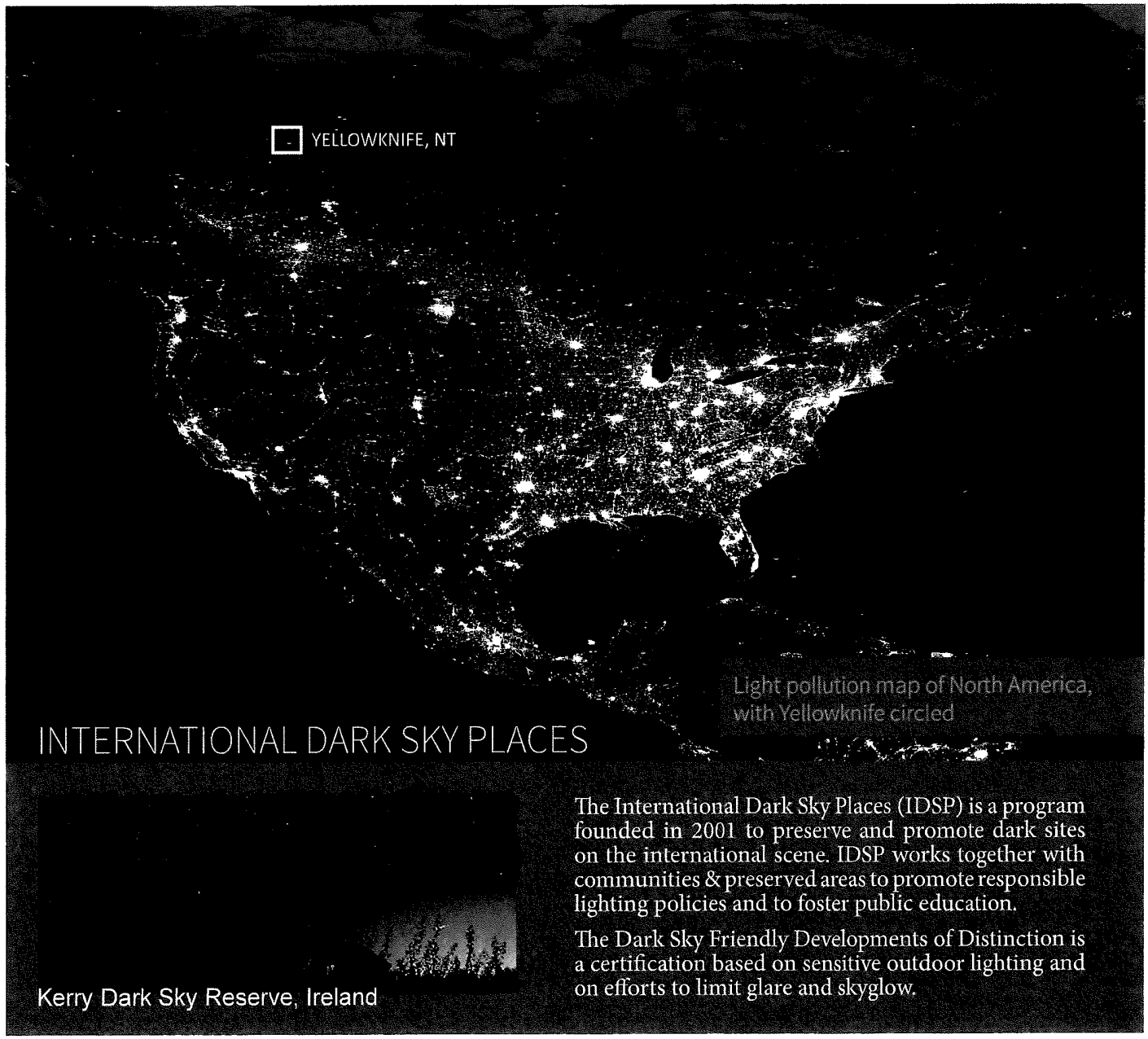
Incorporating project "checkpoints" at the end of years 3 and 5 is a strategy for course correction that mitigates the risk of misaligning outputs with outcomes. Oversight of the three- and five-year checkpoints will fall under the purview of the Smart Cities Committee. This committee will pro-

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vide oversight for the assessment and implementation of the IT Strategy in alignment with the Smart CIty vision and is described in more detail in chapters 3 and 5 of this proposal.

An anticipated risk for Yellowknife is that investors and the private sector will not see the financial benefit of participating in a small market pool. To mitigate this risk, the Incentivization Plan (output C.5) will work with targeted companies and stakeholder groups within the city to design the tools that build the Smart City. A variety of engagement tools will be used: mini challenges, university engagement, rewards and targeted workshops. This Incentivization Plan will be a key element to promote smart cities and encourage engagement.

The backbone technology for the implementation of a Smart City that is replicable across the north will be unleashing the potential of the internet of things (IoT) in Yellowknife, and collecting, organizing and communicating the information in a form that improves the well-being of Yellowknifers (output C.4). This will enable a plethora



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of sensors to be incorporated into the system using the lamppost as a platform. The number of sensors will be a key outcome. We cannot predict which ones will be included and when but some we have identified as promising include: water and sewer tank sensors, leak detection, parking occupancy, snow level, carbon dioxide, distance measurements, trash bin levels, potable water tank level, wastewater tank levels, manhole open/close detection, light sensor, pedestrian, automobile and bike traffic, ice thickness, wildlife activity, water quality, water contaminants, smart valves, and more.

IMPACT STREAM D: COMMUNITY CONNECTIVITY

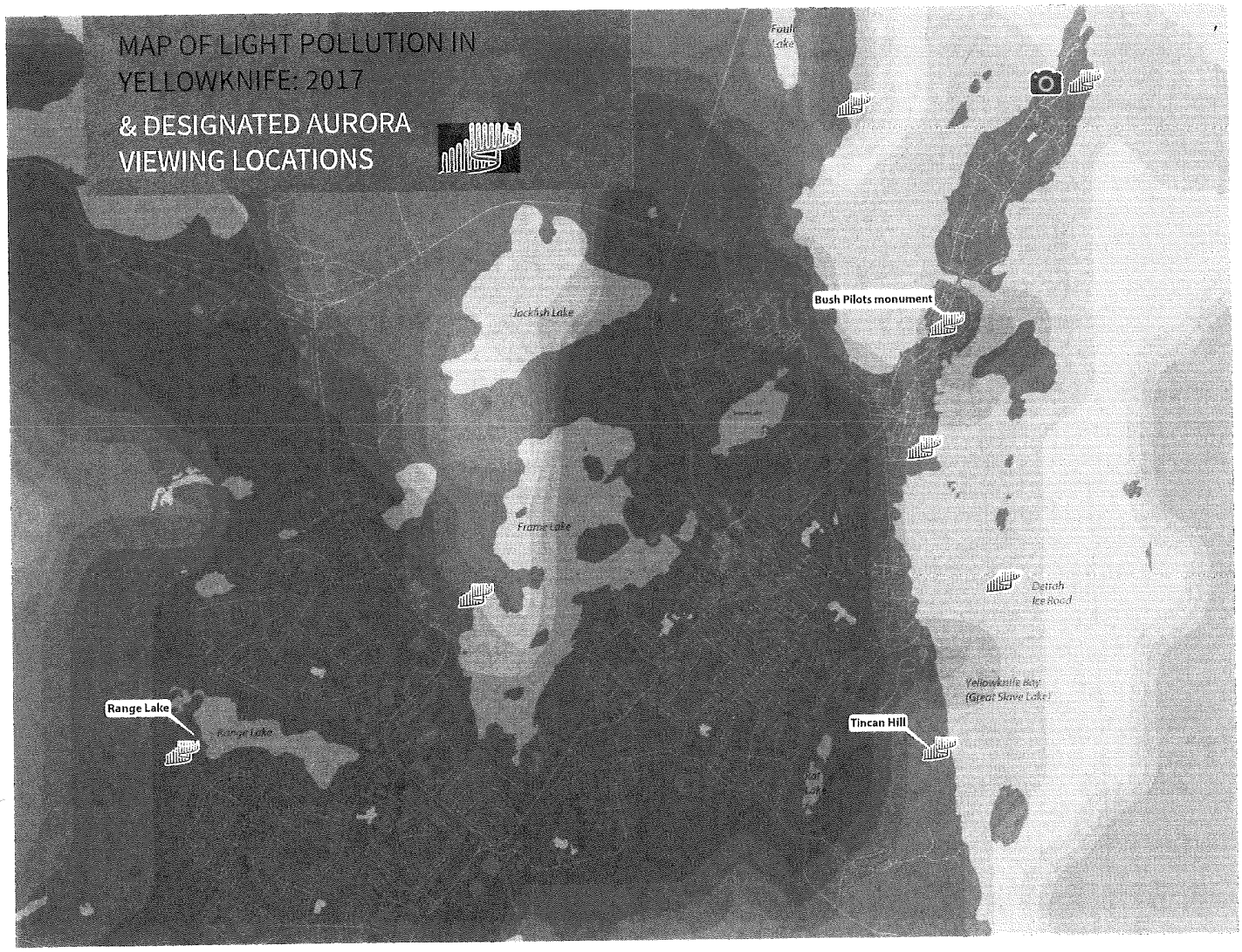
Output D.1 Governance structure in place to oversee the development of a Communications Plan and budget

Output D.2 Annual Engagement Plan to build awareness excitement and engagement in Smart City Evolution

Output D.3 Development of Yellowknife Smart City Dashboard to accompany PingStreet App

Output D.4 Installation of WiFi hotspots throughout the City for free internet services

Output D.5 Implementation of training strategy for municipal employees and contractors to build local labour capacity in smart city technology



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The City of Yellowknife has made great strides towards accountability and engagement with residents. In 2015 Yellowknife launched the Pingstreet app; a one-stop mobile application for the City of Yellowknife services. It currently has over 1,300 unique users in Yellowknife and has proven to be an effective tool for fostering an active and informed community. This application is a free, widely available location-based tool that gives users access to information on various city services like parking and transit. In addition, the City has a tool called PlaceSpeak which is a medium for two-way communication between the City of Yellowknife and its residents. This communication and engagement tool was introduced in April 2016 and has since accumulated 1,284 connected participants, 211 comments, and 17 completed surveys across 14 different community consultation projects. The municipal mapping tool City Explorer communicates information spatially in many layers. These tools form the basis for engaging with Yellowknifers digitally and will be incorporated into a strategic plan for Smart City Engagement, which will become part of the Smart City journey.

The Engagement Strategy and Communication Plan (outcome D.1) will help to build awareness and approval among Yellowknife residents about what a Smart City is. It will also assist in addressing any risks or concerns perceived by the public in order to increase local support for a Smarter Yellowknife. Engagement will be increased by a dedicated budget to improve the engagement tools and communication that residents use to access city services, and by maintaining a clear focus on transparency and openness. The Smart City Dashboard and PingStreet app will be the main points of access to municipal services and information and will facilitate residents' interactions with the city.

The City will assess its Engagement Strategy at the end of years three and five of this project's timeline. This will allow the municipality to keep track of its progress, and reorient efforts towards the most critical problems. These assessments serve as built-in checkpoints for course correction and risk mitigation.

Outcome D.1 Increase in local expertise and literacy regarding Smart Cities technology

Outcome D.2 Increase in engagement on Placespeak and City Dashboard

Outcome D.3 Increase in real-time information being updated in City communications

Outcome D.4 Increase in impact, awareness and reach of technology and Smart Cities

Having a connected and engaged population is key to truly embracing the Smart Cities Vision. This is not easy to do with the competing flood of information and media, but cities are becoming more central to the lives of citizens as information and service provision becomes more centralized online. To accomplish the outcome of a more engaged population, the City will develop a strategy and communication plan, improve and coordinate its existing tools, and develop a new tool, as well as engaging stakeholder groups more effectively.

Continually incorporating stakeholder and resident feedback in planning and activities will mitigate risk surrounding public perception and participation. Following the standard set by ISO 37106:2018 and adhering to oversight by stakeholder committees will ensure openness and transparency in communications.

IMPACT STREAM E: LEADERSHIP IN SUSTAINABILITY

With a track record of sustainability, the City of Yellowknife is no stranger to being a northern leader in green innovation. In 2012 the City attained all five corporate and community milestones in the Local Governments for Sustainability and Federation of Canadian Municipalities (FCM) Partners for Climate Protection program. Since then, the City has also been awarded:

- 2011: FCM Sustainable Communities Award for the Smart Growth Development Plan.
- 2013: Green Champion Award and the Sustainable Communities Award for the centralized composting pilot project

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- 2018: FCM Sustainable Communities Award for Energy for district biomass energy system (saving 829 tonnes of CO_2e/year)

The continued effort toward sustainability by the City of Yellowknife is demonstrated in the 2015 to 2025 Corporate and Community Energy Action Plan. Building on the 2006 Energy Plan, this new rendition sets a target for a fifty percent reduction in greenhouse gases by the City Corporation and thirty percent reduction by residents and businesses.

Output E.1 The creation of an incentivization plan for electric vehicle penetration in Yellowknife

Output E.2 Continued improvement of partnerships with key stakeholders

Output E.3 Installation of municipal EV charging stations

Output E.4 Promotion of GHG emission reductions through incentivization of Smart Cities technologies

Output E.5 Assessment of and reporting on progress towards achievement of the UN Sustainable Development Goals.

A Smart City framework will help the City take one more step forward to achieving this ambitious plan. The framework includes best practices, better engagement tools, and harnessing the power of information and technology to reduce energy use and greenhouse gases. Possibilities for improvements include lighting retrofits, electric vehicle encouragement, sensors that reduce costs incurred by the city, energy costs and greenhouse gases, and even incorporating new biomass heating technologies. In order to direct this project's strategy around sustainable action, The United Nations Sustainable Development Goals were selected as overarching key performance indicators. These were selected during the 2-day Community Design Charrette retreat, and through a selection process led by residents and stakeholders were narrowed down to goals that were applicable to the Yellowknife context. In short, 4 goals and 9 targets were chosen the most critical for immediate action in Yellowknife.

See Chapter 6 *Multi-stakeholders 2-day Design Retreat* for the detailed story.

Outcome E.1 Yellowknife will lead the North in Electric Vehicle penetration per capita

Outcome E.2 Measurable pogress toward the targets set in Yellowknife's Corporate and Community Energy Plan

Outcome E.3 Reduction in electricity use from dimmable streetlights

Outcome E.4 Reduction in water and energy use and carbon emissions from improved city services

Outcome E.5 Progress toward achieving the United Nations Sustainable Development Goals as detailed in the Phase 1 Design Charrette Report

As a true leader in sustainability, the City sees this opportunity as a way to improve its credentials, and use information and the Smart Cities framework as a methodology for more efficient use of internal resources, better services to its citizens, and a reduction in greenhouse gases and energy use.

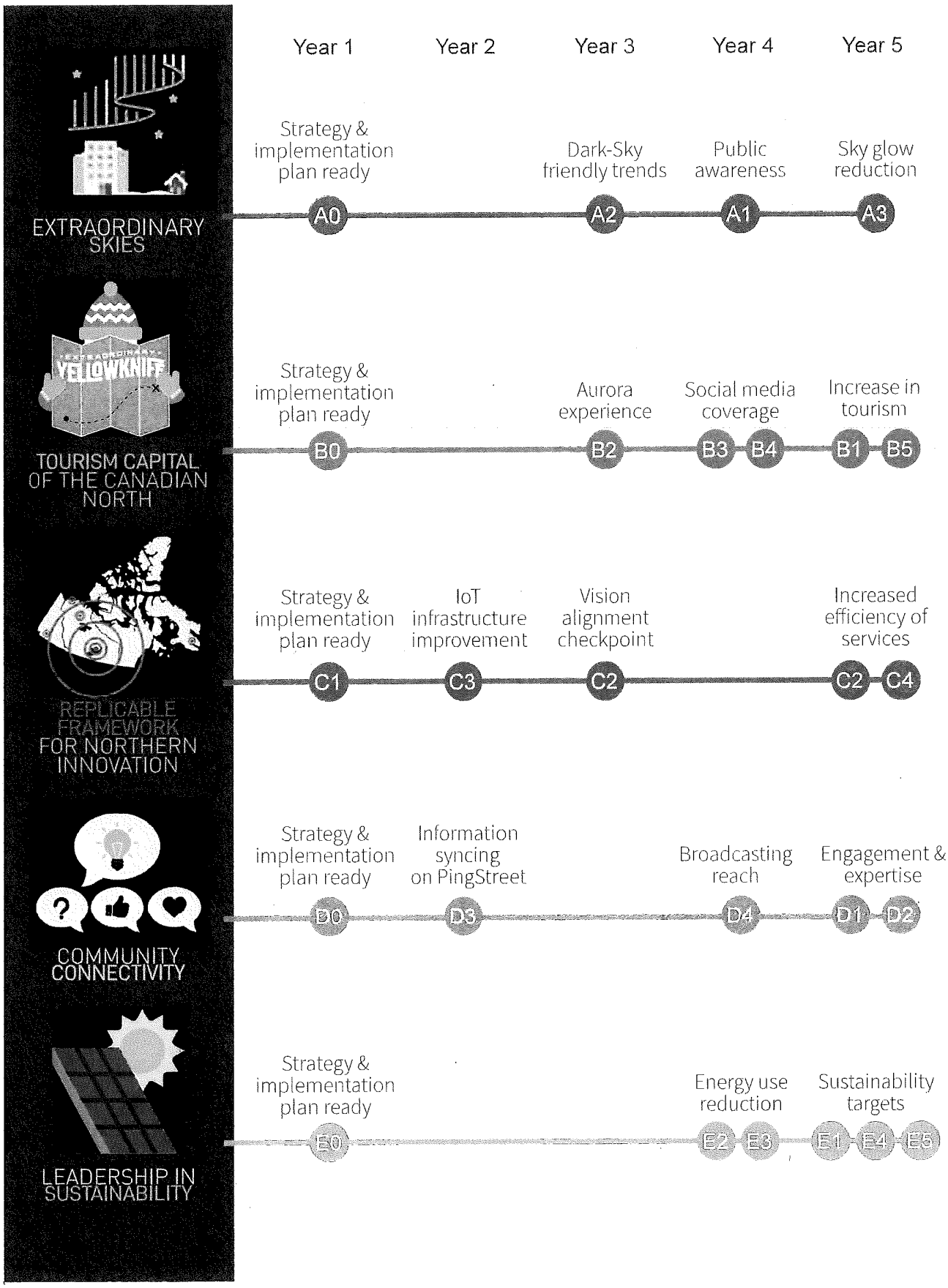
Being more sustainable is clearly a goal that all cities should aspire to. Above what the City is already doing, the Smart Cities approach should help to harness the power of information and technology to further the impact that the City can make.

PAYMENT TIMELINE

Since the Yellowknife SCC project is predicated on the development of coordinated strategies and implementation plans and a myriad of possibilities, it was a challenge to clearly identify outcomes. The following payment timeline will highlight broadly the anticipated timing of key outcomes which will trigger payment.

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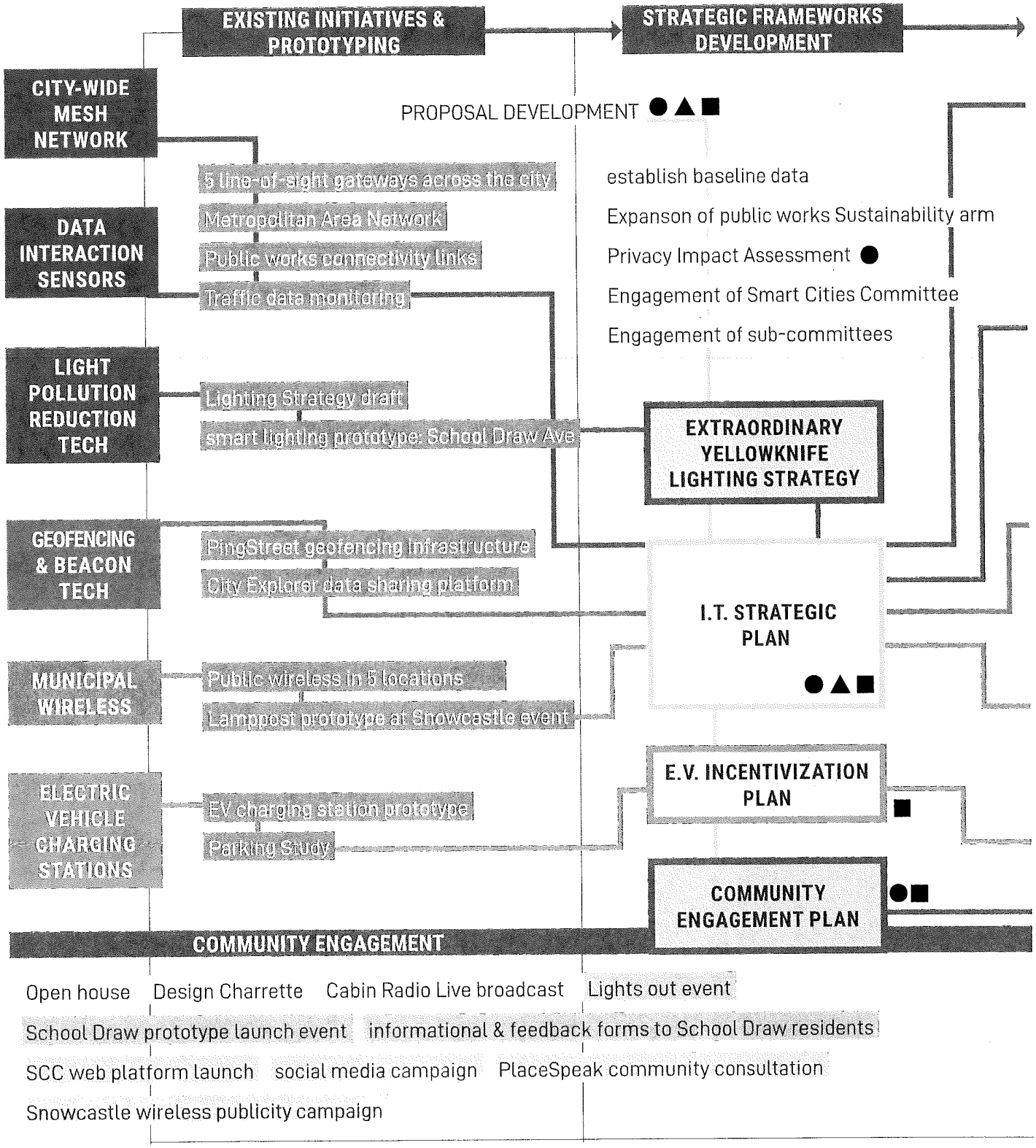
PROPOSED OUTCOMES PAYMENT TIMELINE



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CHAPTER 3

PROJECT MANAGEMENT



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RISK MITIGATION CHECKPOINTS

- ● privacy & security
- ▲ financial
- ■ stakeholder response

PROCUREMENT & IMPLEMENTATION

- Network design
- Backhaul development & Gateway installation
- engagement with utilities contractors ■
- selection of vendors & contractors by RFP process ▲
- hardware installation

- action plan for implementation
- Identify Extraordinary Neighbourhoods ■
- RFP process to select vendors & contractors ▲
- installation of smart lighting technology

- stakeholder engagement re: beacon technology ■
- "areas of interest" decision-making & development
- contractor selection ▲
- app development & testing... ■

- assessment of stakeholder needs ●▲
- bandwidth expansion
- hardware installation

- installation of EVSE based on incentivization strategy

OPERATIONS & MAINTENANCE

update training for municipal employees and contractors

review strategies at three- and five-year checkpoints

continually improve systems based on new technology & stakeholders feedback

MONITORING & REPORTING

contractor engagement & stakeholder response

offerings for IoT services

cost & reach of municipal services

Energy consumption comparison & reporting

Light pollution monitoring with photosensors

Reporting on Dark Sky-friendly trends

engagement with local tourism service businesses

reporting on nubmers for Northern lights tourism

Recording feedback re: aurora viewing experience

tracking of app usage & broadcasts reception

reporting on PlaceSpeak engagement

reporting on social media coverage

EV ownership per capita

tracking of energy consumption by streetlights, utilities and services

research & reporting on progress towards sustainablility targets

development of new layers on City Explorer for open source sharing of information ●

Extraordinary Skies launch campaign for lighting strategy implementation

resident feedback surveys ■

Extraordinary Skies tourism promotion

PlaceSpeak civic engagement forum ■

Publicity campaign: EV incentivization strategy

incentivization of research & innovation to encourage resident/stakeholder participation ■▲

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CHAPTER 3

PROJECT MANAGEMENT

The Project Management Plan aims to align all project outputs with the Strategic Planning initiatives and the City's guiding vision for Smart Cities. The focus is on the sustainable, long-term achievement of successful implementation activities. This necessitates a certain level of fluidity and adaptability, with built-in checkpoints to ensure continual stakeholder support, financial capacity, and data security. The preceding infographic summarizes the sequence of dependencies and scope of activities. Initiatives and outputs are categorized according to the five key impact streams, and will be filtered through a series of strategic frameworks to minimize risk and guide the team's decision-making processes moving forward.

These strategic frameworks will be informed by the ISO 37106:2018 standard and together will serve as the backbone of the Project Management Plan. As detailed below, these frameworks include: a Smart City Vision for Yellowknife, an Extraordinary Skies Lighting Strategy, an EV Incentivization Plan and a Community Engagement and Research Plan. Results from monitoring existing initiatives, infrastructure, and prototypes will feed into these project-specific strategies, which in turn will guide implementation activities in alignment with the community vision.

EXISTING INITIATIVES & INFRASTRUCTURE

The City of Yellowknife has several current or planned initiatives that demonstrate transparency, develop our partnerships, and establish a platform for community engagement and feedback. These initiatives include: an electric vehicle charging station prototype, a trial smart lighting

CASE STUDY: DARK SKY COMMUNITY



NACKA, SWEDEN

The lighting strategy used in Nacka considers the identity, the spatial, social, biological and the technical features of a site. In the North, a unique phenomenon to highlight is that the sun takes a longer time to rise and fall giving origin to an extended warm light and a long "blue hour" at dusk and dawn. In this sense, the lighting strategy plays an important role in re-describing the city's structure, scale and target point at night, facilitating us the ability to recognize the space and navigate through it. Light needs to be linked to time to change with the use of urban space throughout the day and the year, supporting human needs and encouraging meeting at nighttime. Considering biological conditions ensure the reduction of impacts of the light on human health, well-being and the natural habitats of animals and plants. This method helps to classify the urban space and their qualities to focus the light on humankind and their activities.

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project along School Draw scheduled for March 2019, the continued development of a city-wide data transmission network, Pingstreet app, Placespeak forum, City Explorer online platform, geofencing applications, and free WiFi in city facilities. The city's current data transmission network has collectors in multiple locations throughout the city which can forward information to City Hall and play a role in a future mesh network. The Smart City initiatives already underway in Yellowknife demonstrate the city's existing capacity to achieve this project's outcomes.

"The City is already relatively smart and doing many of the right things. We just need to build strong frameworks and continue to innovate."

- Harshen Manickum, IT Department, City of Yellowknife

RISK MITIGATION THROUGH STAKEHOLDER ENGAGEMENT

To help guide this project, City administration will rely on the guidane of Council. This guidance can be provided in assortment of ways (the assembling of a committee, public engagement openohouses, ensuring that expectations and deliverables of the Smart City project dovetail well with the priorities and ongoing responsibilites of the City. Members of standing committees and directors of departments will influence the implemetnation of action items and fine tune the necessary metrics to evaluate success and mitigate risk.

The City recognizes that the implementation of this project will have ripple effects on an array of stakeholders. The gained experience of facilitating Smart Cities charette and public awareness sessions has created inroads with key stakeholders in tourism and economic development. It is anticipated that the City lean on the expertise with in its networks to ensure that the expectations are clear and that outcomes continue to allign with Challenge Statement.

STRATEGIC FRAMEWORK FOR IMPLEMENTING THE SMART CITIES VISION

The Smart Cities Vision will establish a holistic approach to managing both the new opportunities and the new risks posed by the versatile capacity of smart infrastructure. An external consultant will be determined by an open and transparent RFP process. This consultant will work alongside the City and its partners to build a replicable framework for northern innovation. In the context of this proposal, this strategic framework will be called the Information Technology Strategic Plan, or IT Strategic Plan.

This IT Strategic Plan will be a solid foundation of agreed-upon guidelines to mitigate risk in terms of security and adapt to changing technology. The Plan will establish rules for the treatment of personal information, integration of new technology with existing infrastructure, requirements for IT security, access control, auditing, and the retention and disposition of corporate electronic data. While flexible enough to adapt to changes from council or administration, the IT strategy will feed into the City's overall vision and have the potential to be adapted for use in other Northern communities.

Areas of focus for this strategic plan include: technology standards, privacy standards, an internal business improvement process, education and certification around new technology, and a guide for city departments on implementing and getting the most value from new technology. An allowance has been made in the budget for hiring an external contractor to develop this strategy in tandem with the City (discussed in more detail in the Financial chapter). At the three- and five-year mark, a major course correction checkpoint assessed by the Smart City Committee will confirm the alignment of the project's trajectory with the original vision.

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STRATEGIC FRAMEWORK FOR SMART LIGHTING

Building on the shared knowledge of White Arkitekter, the proposed Yellowknife Smart Lighting Implementation Strategy will take a comprehensive look at lighting in Yellowknife and suggest a strategic path to reduce light pollution, increase health outcomes, take advantage of our natural assets and adhere to the Model Lighting Ordinance (MLO). The MLO is the result of extensive efforts by the International Dark Sky Association (IDA) and the Illuminating Engineering Society of North America (IES). Among its features is the use of lighting zones (LZ0-4) which allow each governing body to vary the stringency of lighting restrictions according to the sensitivity of the area as well as accommodating community intent. In this way, communities can fine-tune the impact of the MLO without having to customize the MLO. The MLO also incorporates the Backlight-Uplight Glare (BUG) rating system for light sources, which provides more effective control of unwanted light. The BUG system is discussed in more detail in the technology chapter of this proposal.

Adoption of this ordinance will follow the established development, review, and approval processes of the City of Yellowknife and be informed by the Smart Cities Committee. The MLO is probably best adopted as an "overlay zoning" ordinance. This means that it overlays, but is different from, land-use zoning. It can be added to or integrated into existing ordinances or codes and cross-referenced to other applicable codes and ordinances such as the electrical code, the sign code, planning ordinances, etc. Ongoing renewal cycles will be included when adopting the ordinance.

The main tenet of the lighting strategy described in the MLO is the division of land into 5 lighting zones, LZ0 to LZ4. These are (1) no ambient lighting, which is for use in areas with little to no human activity (2) low ambient lighting, which is for use in rural and low density areas (3) moderate ambient lighting, which is for use in commercial business districts and high density or mixed use residential districts (4) Moderately high ambient lighting, which is for use in commercial corridors, high intensity suburban commercial areas, and town centers, and finally (5) high ambient lighting which is not a default zone and should only be used in special circumstances. The zoning considerations and recommended use areas for each of the five lighting zones provide the City of Yellowknife with a formula for re-assessing its current lighting strategy in order to develop a clear plan of where lighting zone ratings need to be upgraded or downgraded. Further conversations with the City's Department of Planning will need to occur to see how best to integrate these zoning suggestions.The outcome of this strategic lighting plan aligns with this projects outcomes of decreasing light pollution, improving the aurora borealis viewing experience, expanding smart lighting, and developing standards that can be replicated in other communities across the North.

STRATEGIC FRAMEWORK FOR ELECTRIC VEHICLE INCENTIVIZATION

Similarly to the IT Strategic Plan, the EV Incentivization and Penetration Framework will be developed in accordance with overarching city goals and in collaboration with an independent contractor. The City will use this plan to implement tools for EV incentives, while working with stakeholders like Northlands Utilities to build consensus and readiness for widespread EV adoption.

Following along the appropriate routes of assessment and approval, the development and implementation of this strategy would align with the 2015-2025 Community Energy Plan. The installation of EV infrastructure and subsequent increase in EV penetration would contribute to GHG emissions reductions for the City of Yellowknife which is relevant to the goals establshed in the 2015-2025 Community Energy Plan.

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STRATEGIC FRAMEWORK FOR COMMUNITY ENGAGEMENT

The Engagement Strategy for implementing the Smart Cities Vision is discussed in detail in the Engagement chapter and outlined in brief here. Past engagement with residents and stakeholders has set the precedent for a project that is firmly grounded in feedback and collaboration. The City is committed to the principles of openness and transparency, and will follow the recommendations of the Community Engagement Plan to build community awareness of Smart Cities. Administration along with relevant stakeholders help guide the implementation of the action plan and address budgetary considerations at agreed-upon checkpoints.

PROCUREMENT

The City's general procurement policy will be used as a template to develop a policy specific to the IT department and the Smart Cities project. The current standard policy specifies that procurement from a sole source is allowable up to $20,000. If the amount spent is between $20,000 and $50,000 a minimum of two quotes or a request for quotes (RFQ) is required. For procurement operations estimated at over $50,000, a request for proposal process (RFP) or a request for tender process (RFT) is required. The City also has several Standing Offer Agreements (SOAs) with companies for services that they use on a regular basis such as fuel delivery, minor repairs and maintenance.

Each of the technologies outlined in this proposal faces different challenges in terms of procurement, vendor choice, installation, and maintenance. The decisions made must reflect Yellowknife's particular Northern context: its remoteness, small population, and relatively high density and traffic. A procurement plan based on the IT Strategic Plan will address concerns regarding open data, security, ownership, and feasibility. Cities that purchase from vendors rather than developing the technology can devote more resources to policy & service design. The trade-off is loss of autonomy over the end product. Alternatively, projects that prioritize open data and software interoperability tend to adopt a design-build approach and rely on government support for funding. Due to Yellowknife's size and resources, the most feasible option is to partner with vendors and contractors. Due to the interoperability risks associated with a large pool of vendors, financial feasibility and availability of technical support are increased by limiting the pool of vendors. Based on data security concerns it follows that due consideration be given to the ownership of the end product, and must be evaluated when developing a procurement strategy.

CASE STUDY: EV CHARGING STATION STRATEGY

WHITE ARKITEKER

In implementing Electric Vehicle Chargers we can consider the following stakeholders, their concerns, and corresponding result indicators:

1. Municipality: Achieve sustainability goals while remaining cost-effective. Result Indicators: (a) Air quality improvements, (b) Climate change improvements, (c) cost-effectiveness
2. EV Users: Increased mobility (range & time of driving). Resulting Indicators: (a) Accessibility to chargers, (b) Growth in users
3. Residents (non-EV users): Optimize locations while managing parking pressures. Resulting Indicators: Increased utilization of chargers
4. Commercial Partners: Produce positive business case. Result Indicators: cost reduction
5. Grid Operators Concern: Safeguard Grid Quality Result Indicators: (a) risks of power outage / grid-congestion reduced

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City administration will work within the framework of existing policies and best practices to ensure fair procurement procedures. Considerations will be made on how to ensure that procurement protocol is in line with the unique realities of Smart Cities technology implementation. The intent is to keep control of the data while working closely with private partners throughout the proocess.

OPERATIONS & MAINTENANCE (O&M)

Within the 5-year scope of this challenge and beyond, effective O&M will necessitate new training for skilled employees at the City. For certain project activities, a vendor may also be chosen as the responsible party for ongoing O&M or training. Investment in local capacity will be vital to long-term support and future-proofing of the infrastructure. Simultaneously the project will generate jobs and cultivate a local labour market capable of working with innovative technology. Work will be done to understand labour demand surrounding Smart City technology in the context of regional challenges and needs.

CONTINGENCIES, COURSE CORRECTIONS & CONTROLS

Decisions made during the implementation phase are dependent on strategic plans to be developed in line with ISO 37106:2018 and with input from external contractors, partners, City Council, and City Administration. As detailed in the Performance Measurement chapter (Impact Stream A), project outputs will be evaluated at the three- and five-year mark to confirm that strategic plans and corresponding action plans are being adhered to; these checkpoints constitute built-in opportunities for course correction.

The Smart Cities Committee will ensure the adherence of outputs to agreed-upon standards at the three- and five-year checkpoints. Further opportunities for course correction are built into the sequencing of activities, as indicated in the Project Management flowchart. These control checkpoints have been divided into three categories, which respectively intend to:

- Assess budgetary constraints and develop a plan to mitigate risk (Financial Checkpoint).
- Ensure continued compliance with security protocol and protection of personal data (Privacy & Security Checkpoint).
- Gather and respond to feedback from all affected parties (Stakeholder Response Checkpoint).

Forums such as the PlaceSpeak app and City Explorer platform are in place to maximize the transparency of operations, open-source sharing of data, and opportunity for resident input. Partnership with the Yellowknives Dene First Nation heightens the project's adaptability, diversity of perspective, and range of impact. Expanding Yellowknife's Smart City infrastructure into the neighbouring community of N'Dilo will test the replicability of this technology in the North, and expand the beneficial impacts of the project. The involvement of consultants, academia and and utilities provides access to research, experience, and capacity, and serves as a solid foundation for the innovative strategies which will achieve our challenge statement.

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Statue of a musk ox outside of Yellowknife's City Hall in the winter

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CHAPTER 4

TECHNOLOGY

Transforming the ubiquitous lamppost into a beacon for sustainability is the backbone of Yellowknife's planned approach to become a Smart City. The implementation of this smart technology will be guided by the IT Implementation Strategy, which will set the ground rules for technology deployment, and improved policy. This chapter highlights technologies that have been identified in the proposal writing and research stage as promising options to help Yellowknife achieve its challenge statement. In alignment with the governance structure outlined in Chapter 5, the technologies and technology approaches outlined below will need to be approved and reviewed by City of Yellowknife leadership with input from the Smart City Committee.

The backbone of the Smart City vision for Yellowknife is the installation of smart street lighting infrastructure throughout the city. Lighting retrofits must fit within the principles identified by the lighting strategy outlined in the project management chapter and follow an ordered and logical process. The Implementation Strategy will also reflect engagement with the citizens of Yellowknife and their experience with and feedback on the School Draw Avenue lighting prototype. The Lighting Strategy will be developed according to these principles.

Switching to smart lighting has the potential to positively affect people, wildlife, the economy and the natural environment. Orchestrating this switch in the context of Yellowknife will also identify new standards and best practices that are replicable in other northern communities. The strategic thinking around the use of light has been guided by the experience of European leaders such as Copenhagen, and the Swedish experience and knowledge of White Arkitekter. The City will also take advantage of the experience and guidance of the International Dark Sky Association to inform Yellowknife's Lighting Plan moving forward. Project partner and current owner of Yellowknife's lamppost, Northlands Utilities, will bring their experience to the project as a leader in motion sensor lighting technology in North America.

The City will investigate and adopt new Northern-specific lighting best practices that guide light quality, pollution, intensity, and location of light, all with consideration towards Dark Sky principles. Additionally, integrating the combined experience and expertise of our project partners into our lighting strategy is a key step to ensure feasibility and scalability of our proposed technology projects. More on the structure of this smart lighting framework can be found in the project management chapter of this proposal.

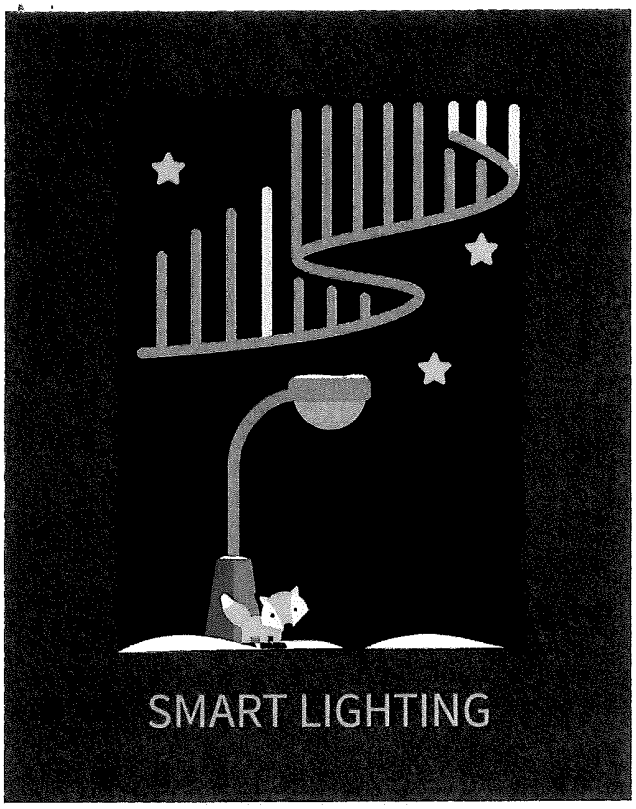
CASE STUDY DARK SKY COMMUNITY



MON & NYORD PARK, DENMARK

The Mon and Nyord Park in Denmark is an example of a successful implementation of dark sky compliant lighting in a community setting. The project's mission was to equip the community with tools and knowledge around smart lighting technology. A concert in the park was organized to announce the Dark Sky initiative to the community and get the interest of the local population. Since the park's International Dark-Sky Association (IDA) certification, it has gotten more and more popular locally and nationally. Over 300,000 visitors came to the park in one year.

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SMART LIGHTING

The switch from traditional non-responsive lighting to "smart" adaptive lighting is a technological leap that Yellowknife is prototyping on School Draw Avenue. This prototype will include approximately 10 smart lighting fixtures. Smart lighting in the Yellowknife context means streetlights that are connected to motion sensors which direct the gradual dimming and brightening of the lights in response to motion on the street. The light will be dimmed to a much lower illumination and energy use when the motion sensors are not activated. When a pedestrian, cyclist, or vehicle is detected it will increase to 100% brightness, equivalent to that of a traditional streetlight. The motion sensors that detect movement will initiate a communication pathway from one lamppost to the next that will trigger the subsequent lampposts to illuminate, expanding your field of vision in the direction you are travelling. As you move past a lamppost, the motion sensor will indicate to the lamp to begin dimming back down to the baseline level of illumination.

This vision for smart light is modeled off of the Dark Sky approach laid out by the International Dark Sky Association as well as the ATCO-led award-winning Intelligent Street Lighting Project in Lloydminster, Alberta. The precedent set by Lloydminster for up to 80% energy savings can inform the possibilities for future energy savings from a similar project in Yellowknife (Lopushinsky, 2018). By collaborating with ATCO subsidiary Northland Utilities, Yellowknife is testing the potential for energy, health and safety improvements, while engaging Yellowknife citizens, nearby homeowners and tourists and understanding the public perception, appreciation and challenges of smart lighting. This will help lay the foundation for a lighting strategy that has the potential to be replicated in other locations across the NWT and beyond.

DARK SKY APPROACH

While the focus of the Lighting Strategy is the smart technology, Yellowknife and Northlands Utilities will continue to be guided by the principles established by the International Dark Sky Association. A Dark Sky Community is defined as a community that shows exceptional dedication to the preservation of the night sky through the implementation and enforcement of a quality outdoor lighting ordinance, dark sky education, citizen support of dark skies and new guidelines for night lighting. A municipal lighting ordinance (MLO) zone plan should be created as a base to define the Dark Sky guidelines for lighting. This is discussed in more detail in the project management chapter of this proposal. Our Scandinavian knowledge exchange partners, White Arkiteker, have provided us with a useful and relevant perspective on lighting technology strategy that incorporates: uplight, glare and light trespass maximum acceptable values, lighting design for urban areas that can activate the city at night, and, crucially, lighting technology that can have the right type of light at the right place in the right moment. Additional examples of lighting strategies for winter cities include lighting policies that control light trespass, façade lighting post curfew hours, lighting that can adapt to the reflectance of ground surfaces and that can dim to a minimum when people are not around. This Scandinavian perspective will be integrated into the Yellowknife approach.

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LAMPPOST LIGHTING TECHNOLOGY SPECIFICS

LED lights have provided significant electricity and greenhouse gas savings over traditional high pressure sodium lights. Yellowknife has completed a full retrofit of their streetlights, but research from our technology partners, and a case study from Denmark, established that LED bulbs with a brightness of 3000 Kelvin or less have been shown to be the least disruptive to animal behavior and human circadian rhythms. The soft white lights from these bulbs is dimmable and even color-adjustable (White, 2019). The color of natural light varies according to the season and time of day and the ability of artificial light to align with these changes impacts both people and the environment. As part of this project Yellowknife will develop and communicate best practice for northern street lighting design.

MOTION SENSORS

The smart lampposts our technology partner ATCO piloted in Lloydminster used smart photocell sensors as motion detectors. This technology is relatively affordable and widely available and, having been tested in a similar climate to that of Yellowknife, appears to be the top choice for motion sensing technology.

ADAPTIVE LIGHTING

Temperatures below zero keep the streets covered by snow during a long part of the year. White and reflective surfaces need less light to be visible than darker and rougher surfaces, such as asphalt or gravel. In line with the seasonal changes, the City's light levels should be adjusted not only based on hours of darkness but also on the presence or absence of snow on the streets and thus the perceived brightness of the surroundings. Smart lighting in this case, can also include adaptive lighting that changes in intensity and even spectral composition depending on the season and time of the day. Having a sensor that measures luminance to trigger different light level settings is today not a standard solution, but is under development by a few known manufacturers in the Nordic countries. Extreme low temperatures can also present a challenge to the technology if sensors and fixtures are covered by snow and ice limiting their function. Mitigation of this risk could involve incentivizing research through the commissioning of a design charrette or an RFP process.

DEVELOPMENT STANDARDS

The Backlight-Uplight-Glare (BUG) rating system provides more effective guidance for unwanted light. The B rating takes into account the amount of light in the direction of the light source opposite from the area intended to be lighted, also known as light trespass. The U rating defines the amount of light into the upper hemisphere with greater concern for the light near the horizontal angles, also known as light pollution. Glare can range from annoying to visually disabling and the G rating takes into account the amount of frontlight. BUG rating limits are defined for each light source and are based on the internal and external design of the light source. The BUG rating limits also take into consideration the distance the light source is installed from the property line in multiples of the mounting height. All three elements of the BUG rating system are taken into account when developing a city-wide lighting strategy, and assist in the creation of lighting zones (detailed in the Project Management chapter).

RISKS

It is important to acknowledge that dimmable lighting will be a noticeable change for the public. Maintaining public engagement, monitoring feedback, and addressing concerns is a critical aspect of implementing this technology and will be addressed in more detail in the engagement section of this proposal. We fully anticipate concerns over safety and security, which will need to be addressed up front and in a positive and constructive manner to win Yellowknifers' trust and build confidence in Smart lighting technology. Targeted awarness campaigns in the prototype area can help respond to resident questions. Feedback and opinions will be documented and a reassessment will occur later in the process to evaluate any change in perspective.

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COST

One of the main challenges with lighting retrofits is the high cost and sheer numbers of lights in Yellowknife. The Lighting Strategy and pilot project will identify costs, concerns and lay out a scalable model to spread the technology throughout the City. Following the successful demonstration on School Draw, we believe the energy savings will provide valuable cost-benefit data to influence the completion of the lighting retrofits in Yellowknife and more remote diesel fueled communities throughout northern Canada.

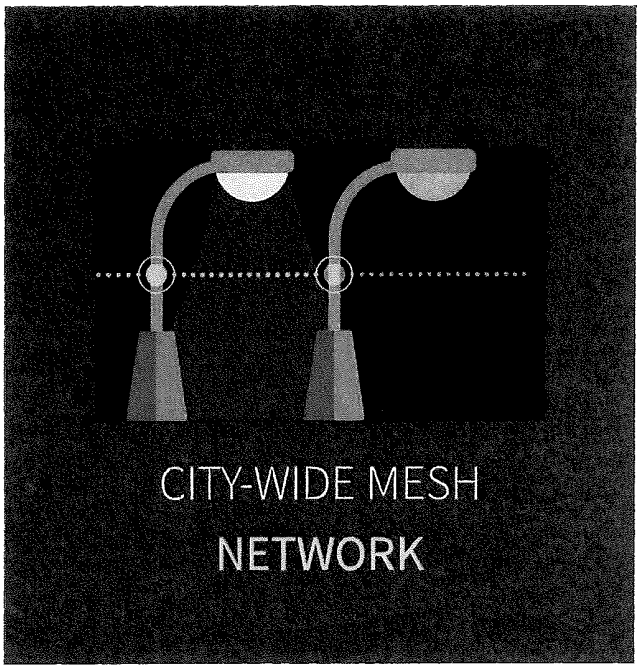
FUTURE-PROOFING

Another challenge is the future-proofing of the system. Technological advances in lighting are happening quickly and being a trailblazer includes risks of obsolescence and being eclipsed by new technology. The Smart City Committee will address this within strategies of IT and lighting to implement open and non-proprietary technology and regularly review and make adjustments for technological innovation and flexibility. This involves implementing a lighting system that allows some flexibility for updates in the near future. This is built on systems where LED modules are easy to replace, where sensors use standard-global connectors, and where the overall technical equipment is interoperable rather than customized.

QUOTE

"The City of Yellowknife has prime locations in the city to act as collectors where multiple neighborhoods could uplink to. This means that in each neighborhood, a cabinet or building with equipment can be placed to be a connection point for the lampposts in that area. This equipment can then forward the data to our collector sites and then to City Hall or beyond (Internet). This equipment routes Internet Protocol data(IP) but not other protocols such as Blu-tooth or Zig Bee that are used by many sensors manufactured today. These sensors will need technology to communicate with that can translate to the IP network and beyond"

- Chris Goit, Network administrator City of Yellowknife IT Division



MESH NETWORK

Yellowknife, like most cities, is connected by a spider web of lampposts on almost every street, park, parking lot or corner of the city. In a typical city each one acts alone, powered by an electricity feed, and turned on or off by a photocell, in every sense they are a relatively simple technology which does not often live up to its almost limitless potential. Imagine a city where these lampposts were connected to each other, and to a central information hub via a set of gateways. The potential is ripe for City managers, utilities, contractors, and entrepreneurs to connect sensors into the network to collect information, control a myriad of products and provide residents with more efficient and better services and knowledge.

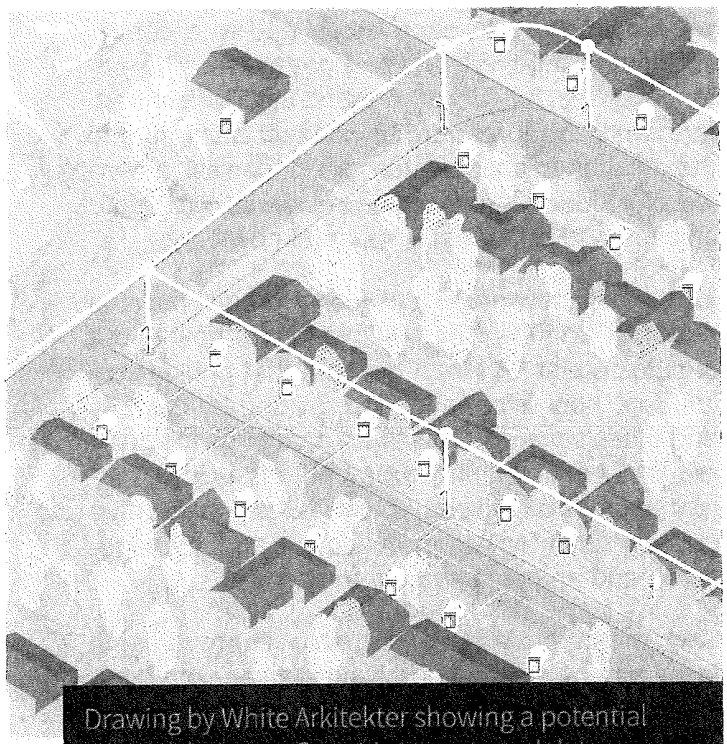
This mesh network is not just a dream but it is possible, and the City will investigate how to put in place a plan to test a network that could revolutionize how information is provided by the City and other services. This is an ambitious task and requires continual improvement to the City's current system of gateways, as well as supportive policies for information collection and management, and an optimized control centre.

This mesh network will enable improvements to municipal services such as delivery of water, collection of sewage, and monitoring and maintenance of roads and trails (not just snow clearing, but drainage, permafrost damage, traffic flows

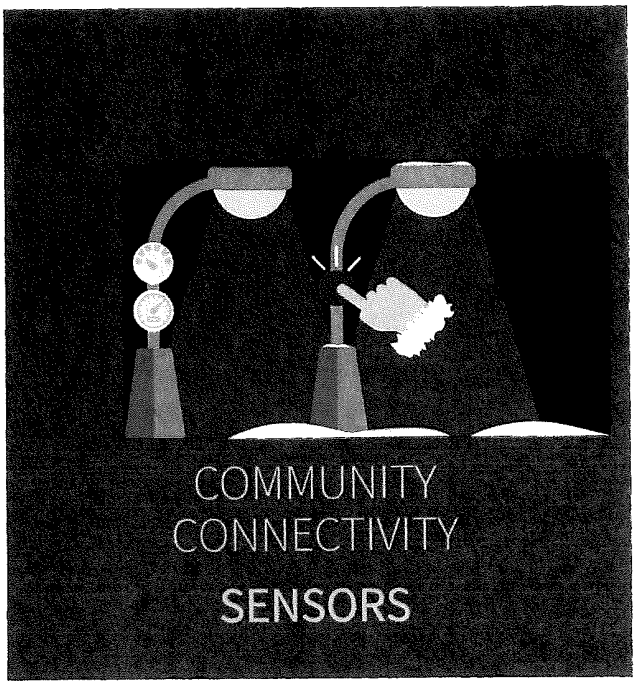
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and streetlight controls). Contractors of services such as waste collection, electricity, fuel, trucked water and sewer delivery could use data to improve services and reduce costs. Further down the road the City envisions opening up the mesh network capabilities and information to businesses and innovators to test applications in the harsh and unique set of northern circumstances. This will create economic benefits and build a knowledge and information based economic hub that puts Yellowknife into the forefront as a small, well controlled laboratory for innovation in Smart Cities technology.

None of this is without risk. The City must ensure its strategy and policy are sound and that Council, Administration and citizens of Yellowknife understand the Smart Cities Vision. Openness and transparency are paramount to gaining trust and confidence in this vision. To do this will take an investment of money, staff and time to ensure the strategic building blocks are in place, while engaging the public and stakeholders and field-testing and improving the technologies that will help build our Smart City.



Drawing by White Arkitekter showing a potential network between Smart Lamposts and data sensors for municipal waste collection in Yellowknife



SENSORS

The potential for lampposts to be the foundation of a smart city lies primarily in their ability to act as the network to move information gathered by a range of sensors. The following list of potential sensors was informed by research from our technology partners. There is a vast and growing list of technologies that are possible here, and they are further expanded by creativity and circumstance in how they might be used. This category is intentionally large in order to demonstrate that this smart cities project has potential beyond the scope of this funding and timeline. The intention of Yellowknife is to use sensors to improve municipal services first, outsourced services second and open it up to the limitless possibilities of entrepreneurs in the tech industry when the conditions are right.

PIPED WATER LEAK DETECTION

It is estimated by the Public Works Department that 30% of the city's water is lost to leaks in the system. Aging infrastructure, exacerbated by the challenges of permafrost contribute to the pipe-water system inefficiencies. The cost of this water loss to city finances is measured in hundreds of thousands of dollars a year.

The installation of a smart sensor onto existing fire hydrants provides a promising leak detection monitoring solution already in use in Medicine

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SENSOR TECHNOLOGY

TEMPERATURE, HUMIDITY, CO2



Climatic data
- monitor climatic changes
- forest fire smoke detection
- pollution level

LIGHT POLLUTION METER



Brightness of the night sky
- monitor light pollution
- data for astronomy

PARKING OCCUPANCY



Vehicle detection in parking spaces
- monitor vehicle data
- parking lot occupancy in real-time

WATER LEAK DETECTION



Water leak detection in water conducts
- measure water consumption
- wireless water conservation

LEVEL DISPLACEMENT



Measures distance to objects
- snow fall monitoring
- ice on roads

WASTE BIN DETECTOR



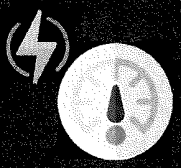
Collection efficiency
- waste management
- help public works
- full/ empty/ flame risk/ fallen

PUSH BUTTON



Multi-purpose buttons linked to different functions
- survey on satisfaction
- panic button
- control lights

METER READING



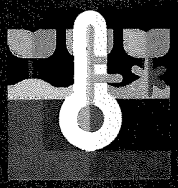
monitor consumption
- electricity monitoring
- gas fuel tank
- disfunction detection
- comparison of data

MOTION DETECTOR



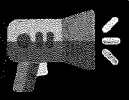
Movement of people or objects in a 4 meter radius
- dimmable lighting control
- efficiency of the lighting strategy
- pedestrian safety

PERMAFROST



Permafrost temperature measurement
- data for geologist
- monitor changes in permafrost
- thermistor reading

NOISE METER



Noise level in dB
- monitor noisy/quiet spots

WATER/SEWER LEVEL



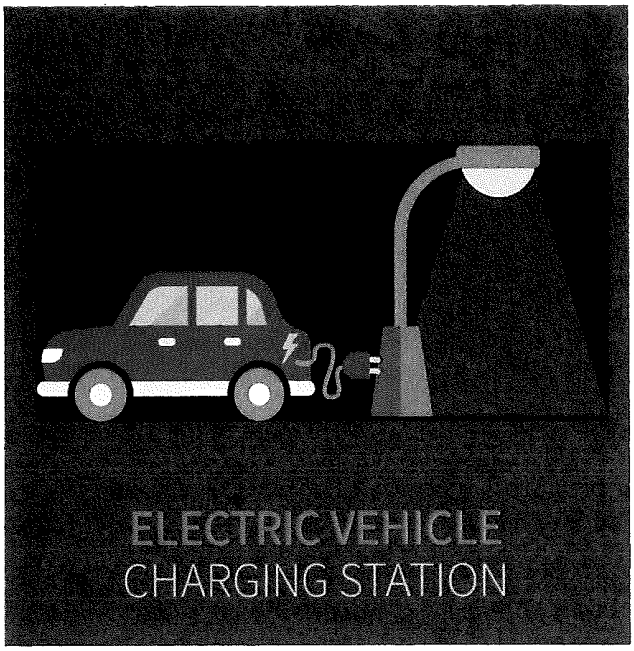
trucked water efficiency
- water/sewer tank level
- measure water consumption

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Hat, Alberta. A portable node uses an acoustic sensor to monitor the sound emitted by water flow in the hydrant and attached piping system. It is highly sensitive to acoustic variation and is capable of detecting even the faintest leaks that traditional monitoring systems often miss. In addition to the sensor itself, the node includes analysis software that monitors the progression of the leak over time. A network of lampposts that would transmit this data to a central data center would enable improved real-time leak detection and potentially save the City considerable time and money.

WATER LEVEL MONITORING

Rather unique to the north, trucked water and sewage services fill and empty tanks in and under houses in permafrost areas. Roughly one quarter of Yellowknife houses, including all houses in Dettah and N'dilo, have water delivery on a bi-weekly schedule. This isn't always on an efficient schedule, and an on-demand service could potentially better service these residences using a sensor installed into tanks to relay water level information to the lamppost, and subsequently to the control centre and provider. Challenges with running out of water, and unnecessary service delivery could save citizen's money.

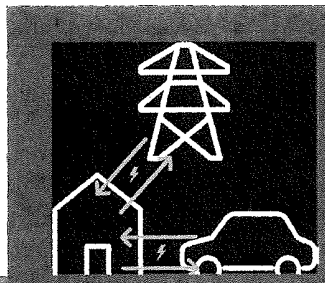


EV CHARGING STATION

The City of Yellowknife wants to be forward looking, and embracing electric vehicles (EV) as the future of vehicular transportation is part of becoming a Smart City. Generally there are two streams of thought on how to do this: incentivize EV purchases or build accessible charging infrastructure. The City is exploring the considerations of both options. Currently there are two EV charging stations in Yellowknife. The City recently installed a phase II charger at City Hall to charge a new electric vehicle owned and maintained by



Map of Yellowknife showing locations of trucked water and wastewater



VEHICLE TO GRID

Vehicle-to-grid technology (V2G) helps to stabilize the energy grid through the installation of a new charging system for EVs. The battery of an EV becomes a mobile energy storage system that can supply energy to the grid during periods of high demand. Residents can be paid for the service their car offers to the grid. This is very promising to reduce diesel dependency in a lot of communities in the Northwest Territories.

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the new YK Car Share Cooperative but available to City staff during working hours. This initiative will demonstrate the effectiveness of EVs to work in the frigid north and show leadership by the City.

Yellowknife is also working with Northlands Utilities to install one phase II EV charging station on a lamppost located in or in close proximity to the downtown core. The potential of EV charging stations integrated into lampposts provides promise for broadening the demand and possibilities of EVs as electricity becomes the standard fuel of the next decade.

Not anticipated in the timeline of this project, nevertheless a future potential application of EV connectivity via lampposts is vehicle-to-grid energy management technology. Piloted successfully in Copenhagen in 2016, this technology allows electric vehicles to act as mobile energy solutions. When not in use, the vehicle is plugged into stations that connect to a city's energy grid and enables them to provide excess energy to the grid or recieve energy if necessary. This optimizes the power available to the grid and is especially useful in the case of unexpected surges in power usage (Automotive World, 2016).



Map of Yellowknife showing potential locations for EV charging stations

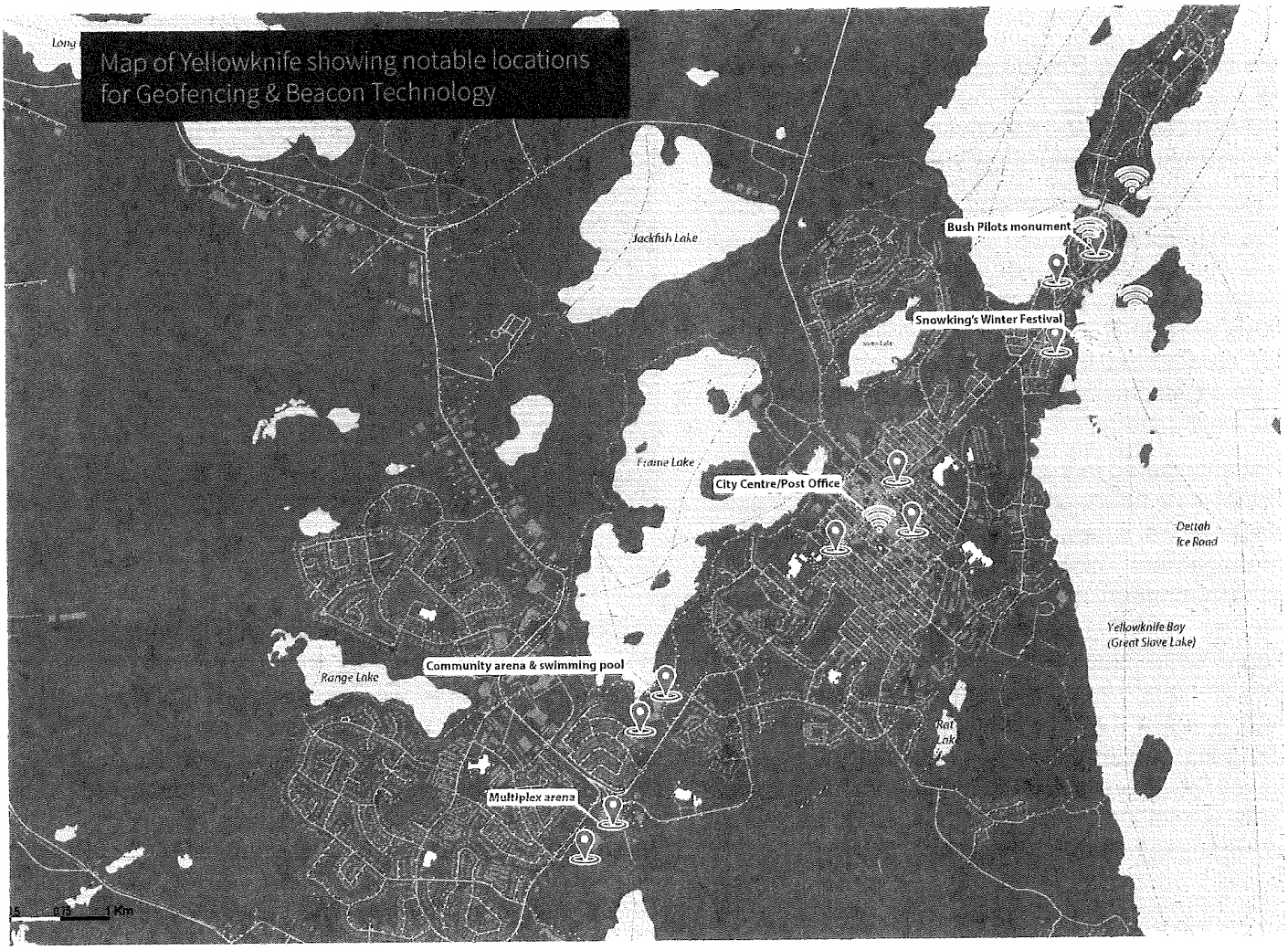


WIFI

Incorporating WiFi access points into lampposts in key junctures in the City will broaden the existing free municipal wireless network limited to municipal facilities. Exploring how to make digital services more accessible will increase wellbeing for both residents and tourists. The sharing of information is pivotal to the transition towards a smart city.

This is simple technology and easy to replicate and build on. Although not a key part of the Cities Smart City vision, it is another example of the ability of the lamppost to provide services and transmit information. Currently, there are six municipal locations in the city that offer free WiFi: Center Square Mall, the Library, City Hall, Samba K'e park, the Multiplex, and the Fieldhouse. After engaging with residents during a two-day Design Charette in August, 2018 several more sites were put forward as locations where WiFi would be useful: the Snow Castle, Old Town, the Government Dock, the Airport, and the Boat Launch at the Yacht Club. The City is considering the extension of its WiFi at the Snow Castle to improve the experience for tourists and locals at this key tourist location.

The creation of wireless connectivity between lampposts is a solution which could implement multiple smart city services that require a mesh



network as a foundation. With the expansion of the public municipal wireless network come several risks, both to the user and the owner. These might include Man in the Middle Attacks (MitM), snooping/sniffing, and malware distribution. The City can help to limit these risks through public education. Risks to the network owner include bandwidth and network abuse (i.e. Denial of Service) and the possible use of the network for cyberattacks (O'Higgins, 2016). Public WiFi operators can protect themselves from liability of network misuse by implementing Terms and Conditions of Use Policies which includes: an indemnity statement, an acceptable use policy, a privacy statement, and a description of service level commitments (O'Higgins, 2016).

CASE STUDY: FREE WIFI



TRONDHEIM, NORWAY

The city of Trondheim is a case study in the use of a municipal wireless network in a larger community. The network auto-connects the user's smartphone device to the most appropriate wireless network nearby at any point throughout the city. Also available is a free wifi map of Trondheim which works without internet connection, helping to find the closest free hotspot.

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GEOFENCING AND BEACON TECHNOLOGY

Geofencing and beacon technologies are platforms for public engagement and ultimately work towards this project's goal of developing an active and informed community. The more immediately available and realizable of the two technologies is geofencing. Geofences are fixed regions that define an area with a width between 200 meters and 2 kilometers on a map. Using GPS technology and cellular coverage, when a user of the associated mobile application passes into that region, they will receive a notification on their device. The notification, or broadcast, is a short 140 character or less message whose contents are defined as part of the geofence. The associated application in Yellowknife is the PingStreet app which is free and widely available to residents. The feasibility of implementing geofences has been demonstrated by the installation of 3 active geofences within the City of Yellowknife. While these geofences do not currently have any associated broadcasts, their broadcasting capability has been piloted with over 1500 subscribers. Expanding this capacity using the smart lamppost infrastructure would increase the City's ability to engage directly with residents to share information like pool schedules, road closure alerts, and event notifications. One of the geofences that is active currently is at the Yellowknives Dene First Nation. They have expressed interest in using the geofence to broadcast cultural events throughout the year to both tourists and residents. This tech collaboration with a First Nations organization is an important feature of this project's replicability in other northern contexts.

A beacon uses bluetooth technology to broadcast a push notification that is triggered when the user comes within a radius of 3 to 25 meters of the beacon. It functions in essentially the same way as a geofence and, within the context of this project, is especially useful for tourism due to the small broadcasting radius. A series of beacon disks installed in lampposts near historical or geographical points of interest could act as an automated active walking tour of the City. It is important to note that users of the PingStreet app would be required to give their consent to receiving notifications from the City via both geofence and beacon broadcasting.

QUOTE

"Dimmable city lights!! How about an application that we could use to get alert when awesome northern lights are showing up. "

- *Yellowknife citizen*

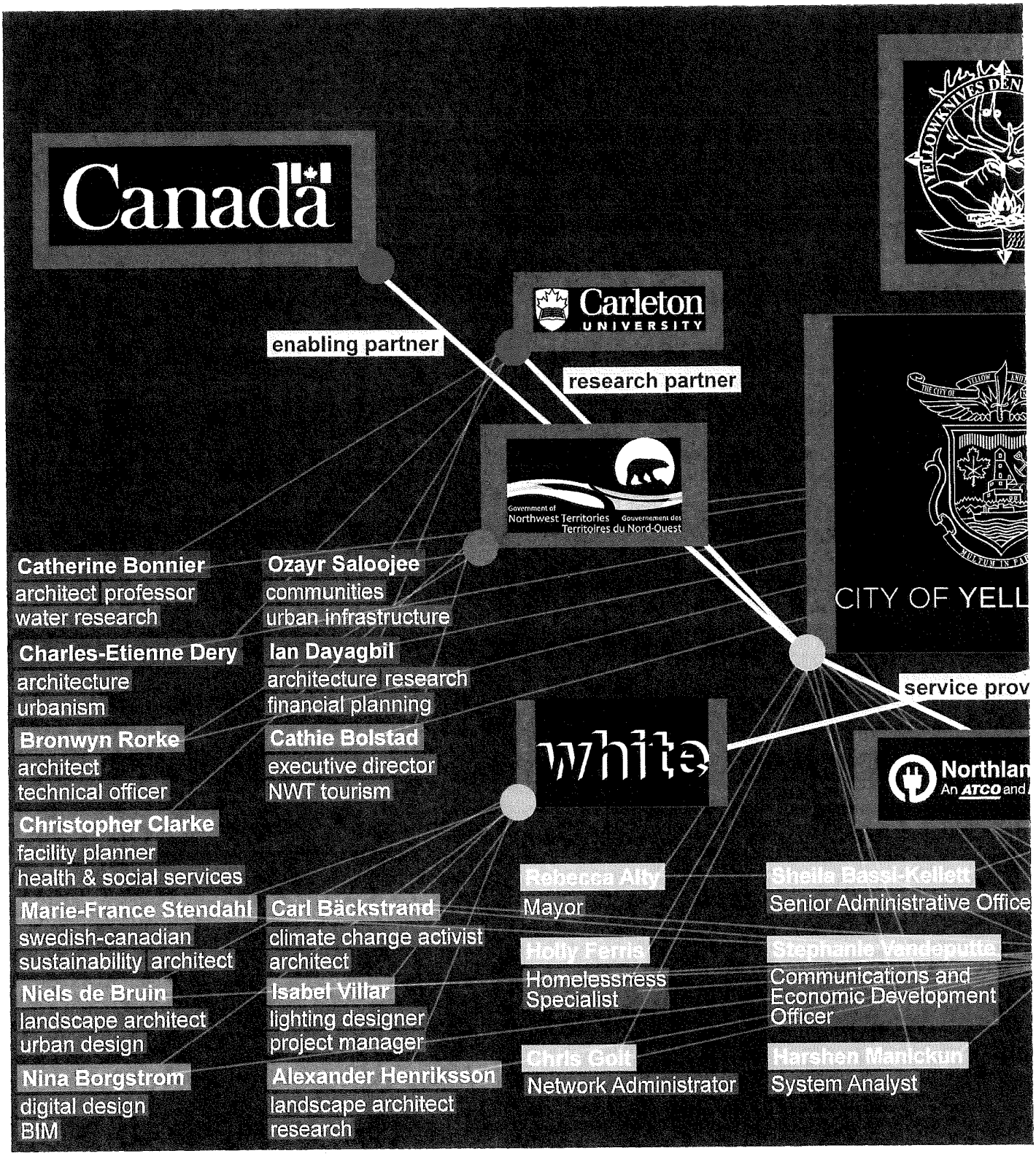
RISKS AND MITIGATION

The standard risk associated with geofences and beacon technology is user privacy. Especially for those who are more technology illiterate, a push notification from the City, even if a consent gateway is established, could be seen as a privacy threat. This project has and will continue to take steps to mitigate the real and perceived risk of this. The City will remain vigilant and up to date on all of their IT systems. We are already in communication with the Office of the Information and Privacy Commissioner of the Northwest Territories regarding the completion of a Privacy Impact Assessment. Privacy concerns such as these are addressed more fully in the Data and Privacy chapter of this proposal.

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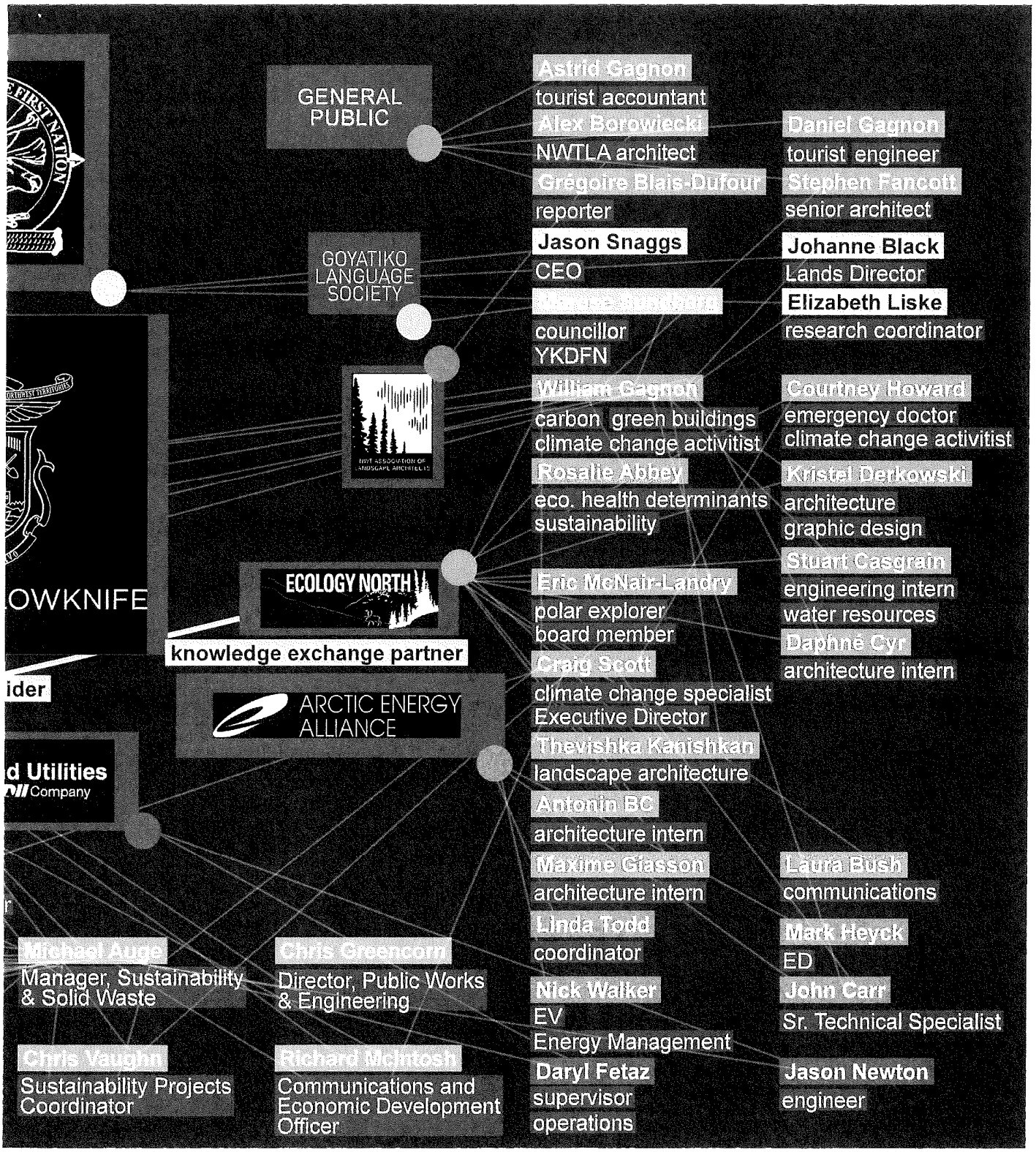
CHAPTER 5

GOVERNANCE CIRCLE OF INFLUE



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CHAPTER 5

GOVERNANCE

Collaborative innovation happens when there is a need or a problem whose solution requires creative input from an array of stakeholders.The City's Smart City Vision encompasses the ideas, concerns and expertise of our indigenous peoples, our local enviromental non-profits, our utilities and international support. Smart Cities are increasingly complex, with an ever higher number of stakeholders who hold diverging and converging interests. To manage these diverse partners and stakeholders, a rigorous governance framework is necessary.

The organizing priority of this project's strategy is to maximize the opportunity presented by the Smart Cities Challenge in order to produce the most benefit for residents of the City of Yellowknife. Ensuring security and transparency of the process, the outputs, and data collected is an essential component of this strategy. Any resources put towards realization of smart city outcomes will be filtered through a governance structure created to secure these aims. A template for Smart Cities governance can be found in the Sustainable Development for Communities guidelines document published by the International Organization for Standardization, ISO 37106:2018. This set of guidelines "establishes requirements for a management system for sustainable development in communities, including cities, using a holistic approach, with a view to ensuring consistency with the sustainable development policy of communities." (ISO website)

LOCAL AND HORIZONTAL GOVERNANCE

Strategic plans will be be developed in alignment with City Council mission and the community's vision, as well as ISO standards. Creating a locally relevant governance framework is essential to the success of the overall implementation strategy. The approach thus far has been to prioritize a horizontal partnership structure with several different parties and stakeholders. This horizontal structure aligns with the City's vision of an inclusive and well-managed community which is welcoming and inclusive. As both a centre of government, law, health and social services, the City's traffic and density are unique within the context of northern Canada. This presents a set of governance challenges that are similarly unique. By meeting these challenges with a horizontal governance approach, this project is aiming to ensure that all frameworks are transparent, efficient, and reflective of the needs of the community.

The governance structure of this project is intended to formalize the roles of partners and stakeholders via the creation of a Smart City Committee. The concept for this committee was introduced in the performance measurement chapter of this proposal. This committee will provide direction and information throughout the lifetime of the project, both during the 5 year scope of this proposal and beyond.

PROJECT PARTNERS:

YELLOWKNIVES DENE FIRST NATION

"Weledeh Yellowknives Dene are one of the peoples of the T'satsaot'ine. The people were known for the pots, knives, and other tools they made from copper collected in the northerly parts of their territory. Before trapping for the fur trade changed traditional occupancy and land-use pattern north of Tinde'e (Great Slave Lake), the traditional territory of the T'satsaot'ine consisted of lands around Great Slave Lake north to the Coppermine River, and east to the Thelon River. Since 1959, descendants of the T'satsaot'ine tribe have lived mostly at Deninu Kue, Rocher River, Lutsel K'e, Reliance, Ndilǫ, Dettah and Enodah. Today, the people call themselves and their territory after the great T'satsaot'ine leader Akeh-Cho: The Akaitcho Peoples and Akaitcho Territory." (excerpt from ykdene.com)

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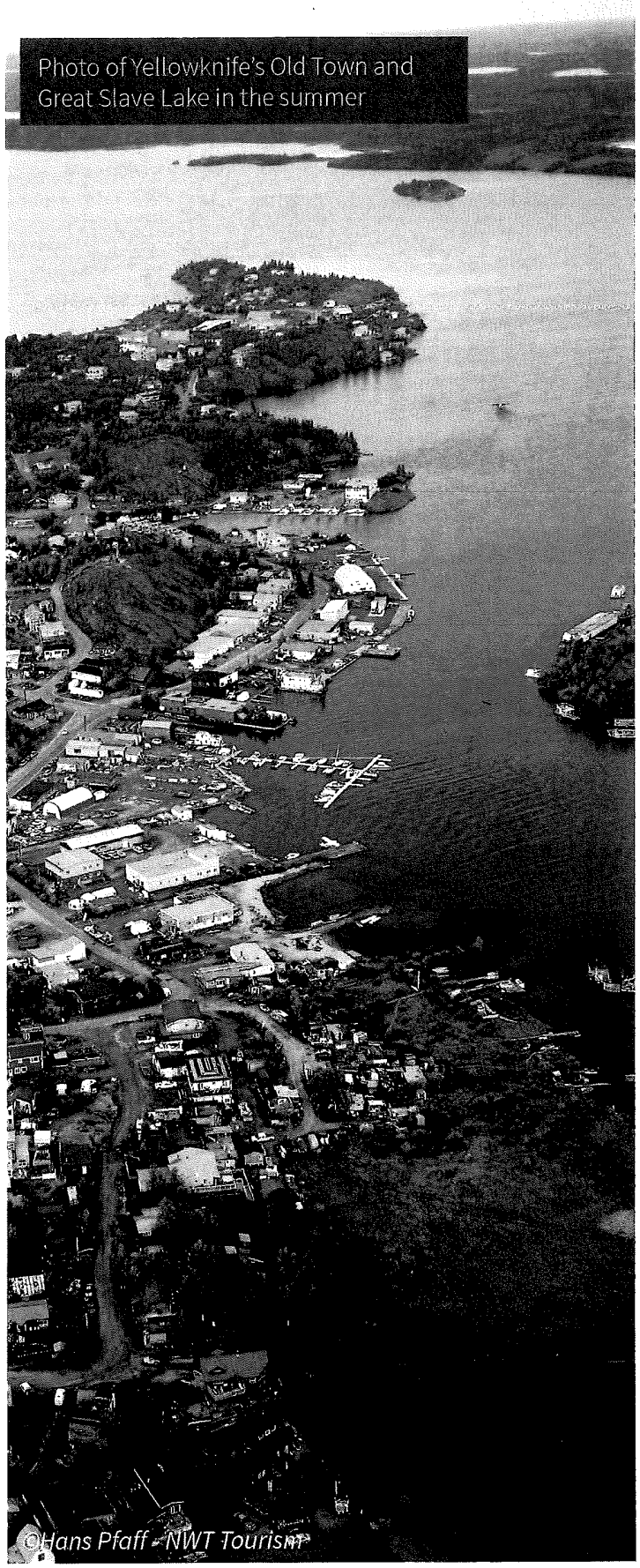
This project is an opportunity to strengthen partnerships with the Yellowknives Dene First Nation (YKDFN) neighbours and to achieve inclusivity, horizontality, transparency and a mutually beneficial arrangement that is in the best interest of residents of Yellowknife, N'Dilǫ and Dettah. Moving towards a holistic and inclusive framework for partnership with our First Nations neighbors is a consideration of critical importance for this project. To this end, YKDFN staff was present during the design charette and the YKDFN community was backed financially by a portion of the $250,000 grant from the first phase of the Smart Cities Challenge. Moving forward, YKDFN participation will be an enabling partnership, in which the City would share resources and try to encourage a continuation of smart city tech into N'Dilǫ.

ECOLOGY NORTH

Ecology North was founded in 1971 in Yellowknife. Over the years the organization has served the City of Yellowknife as the pre-eminent environmental non-profit organization in the North. Ecology North has developed a strong relationship and partnership with the City of Yellowknife, working closely together on many projects, such as the municipal recycling and composting programs, this Smart Cities Challenge, and many co-hosted events throughout the years. As an organization, Ecology North is also active in City of Yellowknife committees and consultation sessions. As a non-profit, Ecology North has a horizontal, inclusive process for decision-making and includes stakeholders and residents in the decision-making process, incorporating diverse perspectives. For this Smart Cities Challenge, the partnership with Ecology North has provided a network for knowledge exchange on sustainable principles. They have facilitated knowledge exchange with the Scandinavian architecture firm White Arkitekter and the Carleton University Urban Research Lab.

NORTHERN CENTRE FOR SUSTAINABILITY

Ecology North and YKDFN are currently partnered on another relevant initiative that will re-



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inforce the outcomes of the Smart Cities project. The Northern Centre for Sustainability (NCFS) is a project that will leverage federal, private sector and academic funding to build the first Living Building in the circumpolar North, and the first carbon-negative building in Canada. This building will be a demonstration in downtown Yellowknife for replicable, scalable, and adaptable cutting-edge technology for northern settings. An innovation hub in the building will be an incubator for emerging green businesses, entrepreneurs, special interest groups, and indigenous youth. By providing a space for innovation, the NCFS is positioning itself to be a potential Smart Cities partner.

WHITE ARKITEKTER AB

Ecology North has been developing research relations with the White Research Lab at White Arkitekter AB, the largest architecture firm in Scandinavia based in Gothenburg, Sweden. White is an expert in nordic design, and facilitates the transfer of knowledge and practices directly to local architects. White has acted as a sub-consultant to Ecology North as they provided them with case studies on Scandinavian Best Practices for electric vehicle charging stations, urban lighting systems, urban planning, urban design, and the integration of the natural and built environments in the best way possible. Ecology North approached White for a partnership with this question: how can we exchange knowledge? To this point, White has provided much valuable perspective in the visioning of this project.

TECHNOLOGY PARTNER: NORTHLAND UTILITIES

Northland Utilities and their parent company ATCO have been the technology partners for this project since its inception providing technological expertise in the area of adaptive lighting strategies for the project's duration. Representatives from ATCO attended the 2-day design charrette in 2018 and have been involved in the ongoing feasibility studies, in the implementation of prototypes, and the monitoring and collection of data. ATCO states that "ensuring [they] operate in a transparent, ethical and accountable manner is critical in creating strong and sustainable value for [their] share owners and in promoting the company's well-being over the long-term" (ATCO, 2018). In addition to their technological expertise, this demonstrates ATCOs compatibility with this project's own scope and vision.



Vew of the Yellowknife skyline from Great Slave Lake in the winter

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POTENTIAL ACADEMIC PARTNER: CARLETON RESEARCH LAB

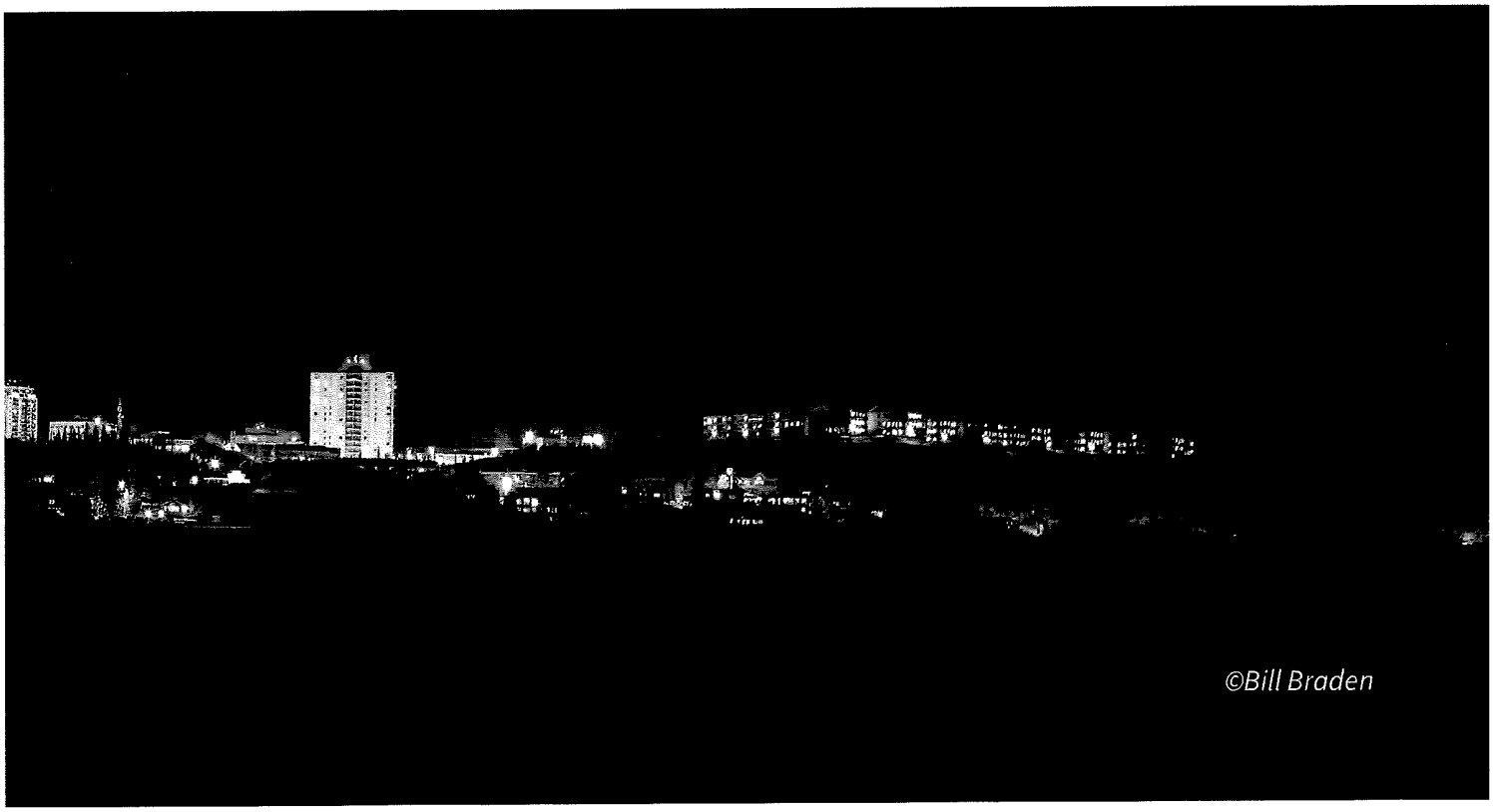
The Carleton Urban Research Lab was co-founded in 2017 by Professor's Catherine Bonier and Ozayr Saloojee. The focus of the lab revolves around questions of water, cities and equity. It is both an academic and outreach unit in the Azrieli School of Architecture and Urbanism. The lab regularly hosts academic and public events through symposia, workshops and design charrettes. This proposal has benefitted from the expertise of the lab in the areas of Smart City technology, including risks and mitigation strategies and future-proofing, as well as in the areas of data and privacy and project management.

INCREASING CAPACITY

With increasing demand for municipal information technology services such as smart sensors and equipment through Internet of Things functionalities, the City of Yellowknife will be looking at hiring another coordinator in 2019 to increase capacity in this department.

SENSITIVE DATA

In order to retain community control over sensitive data, this project's approach to partnerships will prioritize in-house technology development and maintenance, and limit the number of vendors involved. The City of Yellowknife will retain initial ownership of the information collected through the Smart Cities Challenge infrastructure, and in accordance with applicable legislation, it will be up to City Council to decide on the use of this data. Additionally, part of the funding from this project will be directed toward creating a step-by-step guide for entities interested in buying data generated by Smart City infrastructure and using it for commercial purposes. Sequentially, this guide would need to be developed after the creation of a comprehensive IT Strategy Plan as discussed in the project management chapter. The process of ensuring that the sensitive data usage plan complies with the comprehensive IT Strategy will also be the purview of the Smart City Committee and will serve as a privacy and security "checkpoint" or opportunity for course correction and risk mitigation.



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CHAPTER 6

ENGAGEMENT

Information technology can be an ever changing and mysterious thing, and the use of technology for the betterment of society can be fraught with challenges. The City of Yellowknife's engagement with residents and interest groups has been very positive, with lots of energy and excitement about the prospects of a Smart City in the north. But undertones of concern are present about privacy, use of data and the ever-present concept of "big brother." This chapter highlights the engagement to date, lessons learned, the plan to engage and communicate with Yellowknifers, and the vision and concepts of Smart Cities. Also highlighted are some of the risks and risk management techniques we are intending to use to get to the city's goals of using knowledge and technology to improve the community's social and environmental well-being by transforming the simple lamppost as a beacon of sustainability.

ENGAGEMENT TO DATE

Yellowknife is a small city that feels like a big town, and meetings between public officials and local citizens happen on the street or in the check-out line everyday. The City of Yellowknife approached engagement using its partners, in particular Ecology North, to get the word out about this project in a grassroots way. Grassroots engagement is effective at building a base of concerned and engaged citizens, that was built on through events, a multi-stakeholder charette and communication plan. The City will build on this approach by spending time in the first two years of the next phase of the project engaging and working with stakeholder groups to build trust in the City's approach, but also to gain feedback about how people see Smart Cities improving their lives.

This starts at the top, and City Council have been engaged and supportive from the very beginning. On April 23, 2018 council moved to unanimously endorse the Smart Cities proposal (City of Yellowknife, 2018). Through close communication with City staff and partner organizations, Council has endorsed sustainable development, climate action and using technology to help improve outcomes for all Yellowknifers.

OPEN HOUSE

An Open House event took place on April 3rd 2018, just before the first proposal. Invitations were sent out widely with the objective of gaining ideas and thoughts on using the lamppost as a beacon of sustainability. ATCO demonstrated the technology with motion-sensing luminaires and Ecology North worked on generating ideas and building grassroots support.

We received over 50 individual responses to our request for feedback, and compiled and evaluated this information to help guide us in drafting our proposal. Residents identified key areas of concern, and discovered areas that had not been previously considered, which were incorporated into the project proposal. The community engagement Open House was an invaluable tool to understand the issues at the forefront of residents' minds, and allowed the partners to develop a project and potential solutions that truly meets the needs of Yellowknife.

MULTI-STAKEHOLDERS 2-DAY DESIGN RETREAT

In August of 2018, the Smart Cities Team organized a design retreat at the Yellowknife Ski Club. Taking the time away from computers and meetings would allow all participants' creativity to be stimulated, at the edge of the forest beside Great Slave Lake.

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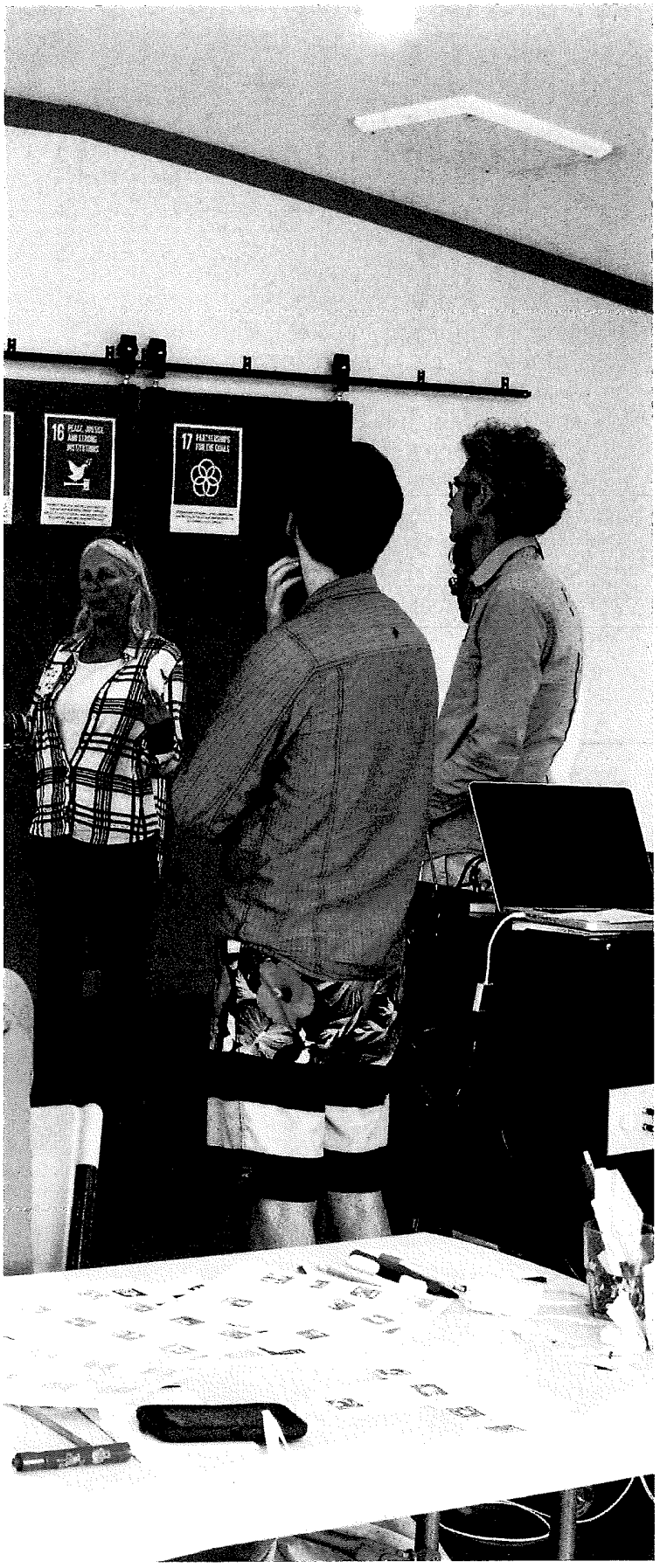
Participants of the 2018 Multi-Stakeholders 2-Day Design Retreat

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Participants of the 2018 Multi-Stakeholders 2-Day Design Retreat

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The full 2-day meeting welcomed participants from all walks of life to share ideas with an innovation mindset. The first day welcomed many Yellowknifers from a diverse range of groups, including but not limited to the tourism industry, academia, architects, landscape architects, and First Nations.

The second day of the charrette was more intimate, and focused on the technical details of implementing a smart street lighting strategy. Those in attendance had vested interest in the proposal, as they would be working on its implementation. This design charrette was a joint facilitation between Ecology North and White Arkitekter AB. Northlands Utilities delivered their knowledge of the lamppost system and technical know how, Yellowknives Dene First Nation shared their deep connection to the land and transformational thinking, and the architects, engineers, politicians, environmentalists, bureaucrats and everyday people brought their Northern innovation, ideas and comments to the table.

The community design charrette was developed to encourage sharing and open discussion through interactive activities. Facilitators initially sought to identify participants' perceptions of Yellowknife and build on the concept of sustainability in a Smart Cities construct, build on the concept of smart lighting that would improve people's connections with the sky and nature, and improve our thriving aurora tourism industry. Many new ideas were brought forward which were duly recorded and discussed and people were truly engaged and excited about the prospects of the Smart City and smart lighting. The full design charrette report is found on the City's Smart Cities Challenge website.

Our community engagement format enabled us to bring together participants from all our partner groups, along with their individual expertise. Participants who attended could engage

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in discussions with all parties in a one-on-one or small group format. From these discussions, participants could better understand what exactly the Smart Cities Challenge was, some ideas already developed in terms of specific issues the City needed to address and potential ways to address these issues. Participants were invited to ask questions and provide feedback throughout the one-on-one engagement, and then after they had a chance to interact with all the partners as well.

Some guiding questions were displayed on different boards throughout the room and people were invited to write their action ideas on a post-it note for each one they wanted.

Though we invited attendees to answer these questions directly, we also encouraged them to provide further feedback that they might have had. The amount of feedback we received impressed us. On top of this, we engaged a local radio station, Cabin Radio, to attend the first hour of our session and broadcast the entire time through Facebook live to encourage more resident to come. Thanks to our varied promotional methods, we saw solid attendance at the engagement session and received feedback that has helped guide our proposal.

LIGHTS OUT EVENT

On November 20th, in what is one of the darkest and gloomiest times of year, the City held a Lights Out Event to bring awareness and excitement about how light pollution impacts the city, and how the Smart City Challenge intends to tackle lighting issues. The City turned out the lights of City Hall and Samba K'e Park to symbolize future efforts and showcase the night sky. Mother nature had other ideas on this blustery evening, but regardless a good turnout and interesting conversations about what night means to Yellowknife were had.

CONSULTATIONS AND SIDE CONVERSATIONS

Yellowknife is blessed to have what must be one of the most engaged populaces in Canada. This is seen in the number of civil society organizations that work to improve all manner of social, environmental and other disparities and challenges. By choosing to work with Ecology North on this project, the grassroots of the environmental movement were engaged. Ongoing engagement with tourism providers and NWT tourism helped the team understand the tourism opportunities and challenges. Northlands brought the knowledge and tools of its Innovation Hubs to the table.

YELLOWKNIVES DENE FIRST NATION

Yellowknife is founded on Chief Drygeese traditional territory of the Yellowknives Dene First Nation (YKDFN). The twin communities of N'dilo and Dettah share borders, and many YKDFN residents live and work in Yellowknife. The City and YKDFN also work closely on shared infrastructure, festivals, and building a better overall community together. YKDFN were invited to all consultation sessions and participated in the Design Charrette, where ideas and plans to incorporate technologies into N'dilo were conceived and developed. Relationship building around a shared vision has continued with discussions at the leadership level, and at the grassroots between Ecology North and YKDFN staff.

The Smart Cities project will further build on this relationship by bringing principles of reconciliation to the project by actively partnering and sharing resources gained from the Smart Cities Challenge. The City and YKDFN are looking to

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forge a new bond based on the promise of technology, a growing tourism industry and celebrating culture and heritage.

SOCIAL MEDIA

The City has a communication plan, and has been working on tools to further its engagement using social media, traditional media and other tools such as Placespeak and the Pingstreet app. This is a weakness the City has had to date, developing and enacting this Communication Plan. The process of researching, learning and developing what this proposal will look like for the City is an iterative one. The City wants to be clear with regards to its Smart Cities messaging in order to best manage expectations.

DIMMABLE LIGHTING SCHOOL DRAW PROTOTYPE

As our flagship prototype the School Draw dimmable light installation will highlight a new look for streetscapes in town. The City intends to use this project to highlight the Smart City project and show residents how this technology will improve the night time experience for Yellowknifers and tourists.

To evaluate and build public support for this prototype Ecology North and City Staff interact with residents in the pilot area to explain the project, answer the inevitable questions about what people in the neighbourhood are going to experience and help the team understand people's concerns while building excitement around this prototype. By asking for written feedback, we hope to develop a baseline of knowledge and concerns, and will follow that up after the prototype to evaluate people's experience with the lights, and whether it changed their enjoyment of Yellowknife's Extraordinary Skies.

The City will also celebrate reaching this milestone with a celebratory event in which the partners and the public will get to see the lights working for the first time. This will be the first time that the public will visibly see a manifestation of what their City can look with smart lighting.

CITIZEN QUOTE

"I think it is a brilliant idea. I think it's great... We were just talking about how to integrate services for bicycles, because a lot of us are year-round bikers."

- Aleta, Yellowknife resident



Cabin Radio's Ollie Williams interviewing Aleta, Yellowknife resident, at the April 2018 Open House

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FUTURE ENGAGEMENT

Smart Cities are a relatively new concept and a challenging one to define and communicate. The City has chosen not to immediately communicate a Smart City strategy and concepts that are not yet fully developed, but anticipate following the ISO 37106:2018 standard and developing an IT Strategy in the first year of implementation to improve communication and engagement that will follow.

The City at this point without pre-supposing the future strategy and policy direction hopes to embrace concepts of openness, transparency, interoperability, non-proprietary and citizen-centric IT and similar themes for engagement. Tools and strategies will be developed to embed this view so the City becomes a leader in working with its citizens to improve outcomes for everyone. To improve this the City will continually ask for input into new ways to incorporate Smart Cities concepts into its strategies and action plans.

Approaches that the City intends to take to get to this point will be to use our current engagement and outreach tools to gather knowledge. These include Placespeak which is a location based civic engagement platform, and the app PingStreet which provides real-time access to helpful information and engaging tools. Along with ubiquitous social media outlets like Facebook, Twitter, Instagram, and the Smart City Yellowknife website, the City will continue to use the person to person, and stakeholder engagement that have been the main platform for engagement to date to communicate the Smart City message.

The plan will lay the groundwork for the use of other tools within the City to reach out to new stakeholder groups. By developing a Research and Engagement Working Group to promote this plan, the City will encourage the public, entrepreneurs, and targeted stakeholder groups to submit expressions of interest and ideas to make the City smarter. Funding in the form of an engagement budget will be provided in years 1 to 5 and each year there will be a different focus (transportation, IT, sensors and tourism, etc) in which the public will be asked in a challenge format to give the City practical, doable ideas for implementation. Other uses of the funds from the engagement budget might be to ask stakeholder groups (ie. artist community to use art to highlight smart city prototypes) or ask seniors to test a technology or envision what a smart city is for them, or hosting workshops for youth to work with technology. Other options might be to host a hackathon in which tech entrepreneurs, or university students from across the country are invited to participate to build solutions that fall within the criteria of our Smart City Vision and concepts.

Other engagement tactics could be to talk with random citizens and ask them how a Smart City or smart streetlights might improve their health, safety or sense of being. Similarly, working with new immigrants to see what needs or wants would make their early transitional years easier could shed light onto areas of improvement. To do all this the Smart Cities Implementation budget will support real hands on learning, workshops, participation with schools and civil society groups. Each of these stakeholder groups brings will attempt to bring out individuals and groups of

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CHAPTER 7

DATA & PRIVACY

PREPARING A PRIVACY IMPACT ASSESSMENT

Part of this strategy is communicating with the Office of the Privacy Commissioner (OPC) to prepare a Privacy Impact Assessment (PIA) that covers the width and breadth of this project. As part of the preparation process for this proposal, the City of Yellowknife has established contact with the OPC and through initial discussions determined that a PIA was not needed at this stage of the project as data is yet to be collected and no privacy impacts are being made. City staff will continue to work closely with the OPC as the project progresses to determine which technologies and aspects of the project require PIAs and to perform this work as necessary prior to the implementation of any potential Smart Cities technologies.

EXISTING POLICY

The City of Yellowknife has established and made public their efforts to integrate security and privacy considerations into municipal technology. This is evidenced in the City's website's privacy policy, which notes user de-identification and gives a complete list of the non-identifying information that is recorded. This sets a precedent for data privacy and security that the Smart Cities Project can expand on. Because the majority of the technologies proposed in this project are not currently in use, their privacy impacts will have to be evaluated by the City or by an independent contractor before they are officially launched.

With regards to compliance with The Personal Information Protection and Electronic Documents Act (PIPEDA), this project in its current iteration does not deal with any personal information. As part of the project management strategy, however, this should be reassessed periodically.

CASE STUDY: ILLINOIS INSTITUTE OF TECHNOLOGY

The Illinois Institute of Technology (IIT) has designated the campus a "living laboratory" by building a microgrid on IITs main campus to experiment with smart technologies. IIT is currently piloting a smart street lighting system configured in a mesh network that communicates with lights that are controlled by the Centre-for Smart-grid Applications.

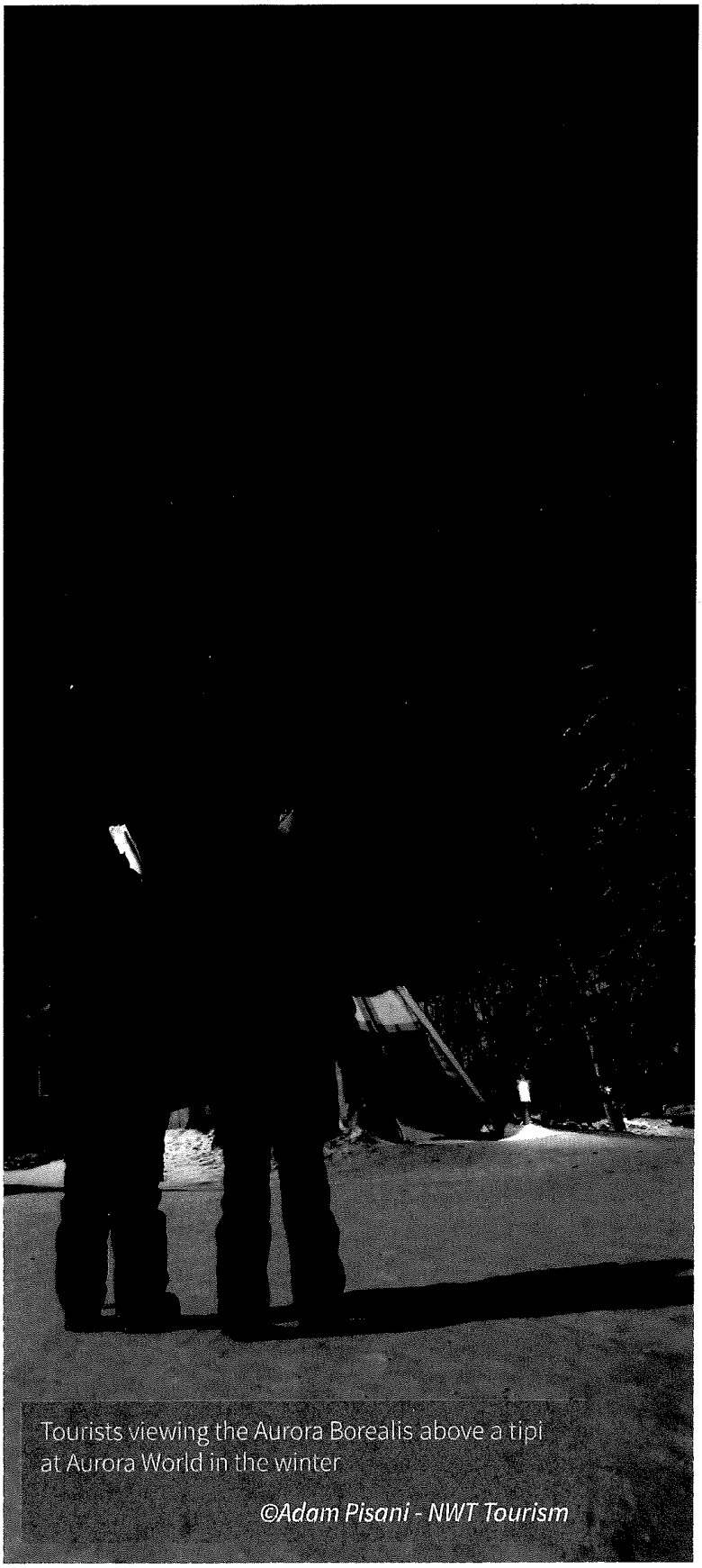
IIT has also piloted two prototype applications (a) emergency response application, and (b) Safewalks mobile application. The Safewalks application adjusts the brightness of streetlights relative to the pedestrian traffic as determined by real-time data.

IIT is particularly interested in cyber-security for their networked streetlight system. They have identified three areas of vulnerability: (a) the communication network, (b) the remote server, and (c) end devices. Smart software is important in maximizing the utility of smart hardware. Cybersecurity is the most important concerns of IoT in critical services that addresses interests of public trust.

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SMART CITIES CHALLENGE: AN OPPORTUNITY

Collectively the municipality and its partners recognize the Smart Cities Challenge as an opportunity to preemptively address emerging issues regarding technology, ownership and security. As a frontrunner in specifically Northern-Canadian innovation, Yellowknife is well-poised to develop secure frameworks of governance with the well-being of its residents as a central priority. The governance structure ensures diligent and consistent dialogue with a diverse range of residents and stakeholders. The City's commitment to accessible, open-source formats is demonstrated in existing infrastructure like the City Explorer portal and Open Data License Agreement. Moving forward, the development of an IT implementation Strategy can provide the opportunity to solidify a long-term practical approach to secure data management. Emphasis will be placed on ownership structures that retain municipal control of data, as well as a framework for adaptability of open-source policies to suit changing needs and technologies. Investing in smart solutions for the Yellowknife context translates readily to applications in remote and cold-weather communities across the country.



Tourists viewing the Aurora Borealis above a tipi at Aurora World in the winter

©Adam Pisani - NWT Tourism

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CHAPTER 8

FINANCIAL

Transforming into a Smart City has the potential to improve the services the City offers its citizens and improve the way it offers those services. It will help the City improve internal efficiency by providing more effective structures for communication and data transfer. The up-front investment required to implement these improvements will be paid back through a variety of benefits and service improvements in the future. The following preliminary budget will highlight the estimated costs and the outcomes and some anticipated cost savings that will be triggered within the five year Financial Plan of the City. The preliminary budget is summarized in the budget document on page 66, and will be split generally into the following five sections: Smart Cities Strategy, Extraordinary Yellowknife Lighting Strategy, EV incentivization Strategy, Research and Engagement and Operations & Maintenance budget lines.

SMART CITIES STRATEGY

The Smart Cities Budget will be the largest single budget area and will encompass much of the technology that most people think of when they envision a Smart City. Consistent with the proposal this preliminary budget will not provide too much detail into the costs of individual technologies, as decisions will depend on the Smart City Strategy, research and engagement and the approach to implement the action plan coming out of the strategy. This approach maintains flexibility and doesn't pre-suppose the outcomes. Dollar figures will be used to limit the scale of technological deployment within the five year budgeting window.

The budget for Smart Cities Strategy will include the Strategy itself and development of corresponding IT policy and tools. There are also improvements to Information Technology within the City itself, namely improving the IT hub, connectivity improvements, and expanding the gateways city-wide. Further to these key improvements, the Strategy and further research will highlight approaches (and estimated budget lines) to mesh network development, expansion of geofencing, beacon technology, wifi expansion, sensors and new technology areas.

EXTRAORDINARY YELLOWKNIFE LIGHTING STRATEGY

Similar to the Smart Cities budget the Extraordinary Yellowknife lighting budget will be dependent to a degree on the strategy and lighting plan developed in the first year. This strategy will highlight priority areas within the city and set the conditions for expansion of the smart lighting, based on the evaluation of the School Draw prototype and lighting strategy. Budget lines for lighting have been included in the budget page and will be a considerable portion of the budget.

ELECTRIC VEHICLE INCENTIVIZATION STRATEGY

A relatively small portion of the budget, the EV Incentivization Plan will highlight a Smart City approach to Electric Vehicle integration into Yellowknife. This will primarily entail piloting and evaluating EV charging infrastructure tied to lampposts and how to leverage this with policy, education and awareness tools to encourage adoption of EV's into a Smart Cities framework.

RESEARCH AND ENGAGEMENT BUDGET

Included in the preliminary budget for this project, which is detailed on the following pages, are considerations for research and engagement. In contrast to the technological projects and associated budgets, the project areas of research and engagement are intrinsically less clearly defined. Maintaining public and private engagement and promoting strategic research around the availability and feasibility of various Smart Cities tools and technologies is an essential component to the success of this project, and will require an

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ongoing budget. Funding will be allocated for research and engagement purposes through the guidance of the Yellowknife Smart City Committee. Decisions on allocating the annual funding to meet the intent and vision behind a Smart Cities framework will be made using an effective, varied and multi-stakeholder approach.

OPERATIONS & MAINTENANCE

The City is going to need the capacity and a coordinator. The Smart Cities Coordinator will be housed in the Sustainability branch of the Public Works and Engineering Department, which is responsible for community energy, waste and broader sustainability initiatives. The Smart Cities Coordinator will manage contracts, coordinate the committees and working groups, coordinate between departments and partners, and general project management of the the Smart Cities project. There will be additional requirements in other departments such as IT, Communications, Public Works and Planning that will be coordinated by the internal existing budgets of those departments.

CASE STUDY: THE COLUMBUS WAY

In 2016 Columbus, Ohio won a $40M fund from the US Department of Transportation. The non-profit organization that won the bid raised an additional $450M by leveraging public, private and academic associations to develop a Smart Columbus project focused on 'smart corridors', a smart grid and smart street lights. With a vision "to be the model for connected cities for the future" its approach to using narratives to engage citizens in a 'collective vision' from a central hub is a model that Yellowknife can aspire to.

CONSIDERATIONS FOR LONG-TERM OPERATIONS & MAINTENANCE COSTS

There are definitely concerns about the long-term costs of increasing the number of staff and operations budgets with additional technology, actions and engagement demands. Through the accounting and financing mechanism already in place, City Administration will continue to reassess and strategically invest in the Smart Cities project. It is envisioned that energy savings, water savings and improvements to municipal services will more than offset any future costs. Key to this project is developing clear baselines and evaluation protocols to understand, value and communicate the results of pilot projects to corroborate the argument and continue to receive public and council support for funding.

LEVERAGING THE SCC FUNDING

The City recently invested in an institutional grant writer and funding analyst. The role of this new position in relation to the Smart Cities is to support with the leveraging of the Smart City budget to expand the funds available for prototype development, technologies, engagement, research and IT. The goal will be to provide additional funding every year for the project and to extend the five year length of the funding to maximize outcomes for Yellowknife's Smart City evolution.

COST SAVINGS

Yellowknife will see improvements in the well being of citizens as the Smart City Plan is unrolled. There will also be corresponding financial savings that will be linked to the rollout of the technologies. Although it is not possible to fully forecast savings, due to the unknown nature of costs, this project anticipates savings on several fronts. The dimmable lighting will be more energy efficient than the current LED lighting. By dimming

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the lights to a lower electrical load for the majority of the time, there is an anticipated savings of both energy and cost. Currently Northland Utilities owns the lampposts and rents them to the City. The smart streetlights will reduce energy which should translate in a cost savings to citizens.

The introduction of sensors linked to the mesh network will also help the City to reduce costs. Although it's too early to forecast what those savings might be, there is evidence to suggest that city services would be improved by sensors, and those cost savings could be reinvested to improve municipal service delivery. A few promising applications are in the early detection of water leaks, improving the efficiency of trucked water schedules, solid waste removal efficiency increases and trucked sewer pump-out. There are considerable costs to water treatment, but in Yellowknife an additional cost is heating the water to 4 degrees Celcius to help limit freezing as the water spreads out around the system. A conservative assumption of a 10% reduction would equal over $20,000/yr saving and save 59 tonnes of CO2.

Another important positive impact though will be to improve the long term growth of the tourism industry. In 2017, aurora tourism brought in $57 million to the Yellowknife economy. But the Aurora tourist economy is cyclical and there is more and more competition for lucrative aurora tourism visits. By taking a Smart Cities approach, installing smart lighting that makes Yellowknife's Extraordinary skies more visible, and providing beacon technology and other tourism products in the home language of aurora tourists, the City of Yellowknife will set itself apart from the competition and ensure a stronger tourism product and boost in revenues. Finally, the City is very excited to transform Yellowknife by putting the pieces in place for cold weather innovation in the Smart City realm. An innovation based knowledge economy will promote entrepreneurial and business opportunities, add a growing sector to the economy, reinvigorate the downtown, and make Yellowknife into a unique laboratory for Smart Cities innovation in a northern setting.

Another opportunity for potential is with ties to academia. The City is well positioned to improve partnerships with academia and the Smart Cities framework would be a big area of potential growth, as would the proposal to bring a Polytechnical University to Yellowknife, and how that campus could be grown from scratch as a Smart Campus. These ideas have not been fleshed out in this proposal but the City is eagerly anticipating opportunities to leverage the Smart Cities challenge into a new and burgeoning growth area in the City.

Approximately $25,000 was budgetted for the pilot project of which half was dedicated to initial capital costs and the remaining for lights and installation. The installation of eight lights works out to approximately $1,500 per light.

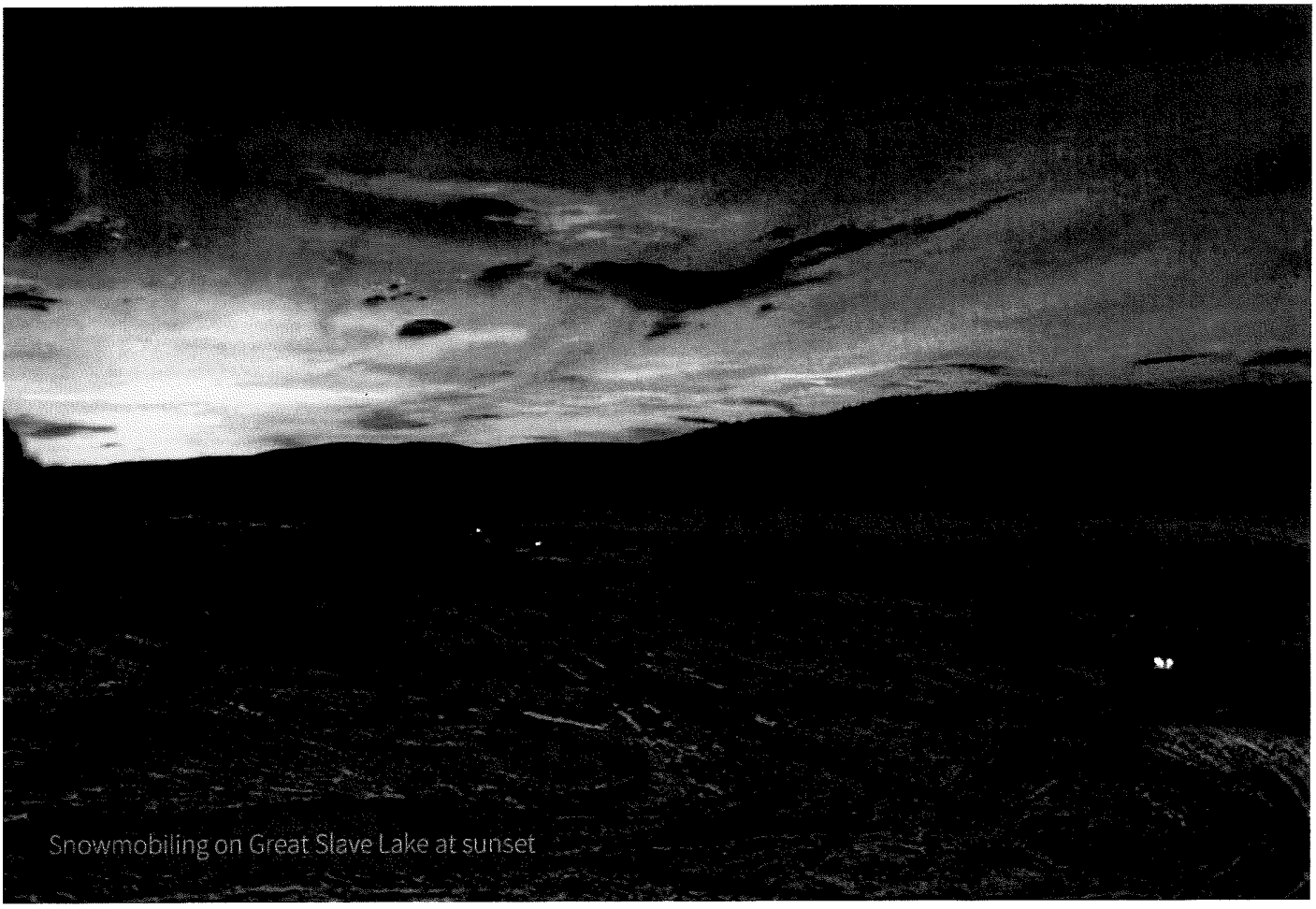
The $5M award would provide us with the opportunity to scale up the project and expand through most areas of town, with a particular focus on residential neighbourhoods. Budgets, capacity and feedback would be continually considered to ensure that the project is in line with City goals and expectations of the Smart Cities funding requirements.

A more robust financial analysis will be linked to the updating of the City IT hub once recommendations brought forth by the IT Strategic Plan have been vetted by Administration and stakeholders.

As the City pushes the envelope for a more connected and innovated North, Administration will ensure that innovation and risk is balanced with financial accountabilty and continual verification to ensure that deliverables are relevant and that expectations are manageable.

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Breakdown of $250,000 Finalist Grant		
Design Charrette Facilitation and Expenses	$	42,055.15
Drafting of Final Proposal	$	75,000.00
Geofencing Pilot	$	10,350.00
Finalist Video	$	10,000.00
Jury Check-In (Toronto travel)	$	2,000.00
Lamppost Pilot	$	25,000.00
Engagement Misc. Cost (rental+food)	$	1,000.00
YKDFN partnership	$	25,000.00
Finalist In-Person and winner announcement	$	10,000.00
staff time	$	49,594.85
Total	**$**	**250,000.00**



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PROPOSED YELLOWKNIFE SMART CITIES BUDGET

	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Extraordinary Skies Action Plan						**$1,480,000**
Lighting Plan for the City of Yellowknife Research, Design and Development of a Lighting Plan for the City of Yellowknife in partnership with local architects, designers and urban planners.	$125,000		$10,000		$10,000	$145,000
Light pollution baseline determination Assessment of current levels of light pollution based on available technologies, to be used as a baseline for the identification of quick turn-around deliverables, and for progress verification midway and at the end of the implementation plan.	$15,000		$10,000		$10,000	$35,000
Best Practices Guide for Dark Sky Compliance		$15,000				
Lighting retrofit and upgrades implementation Retrofitting and upgrading existing lamp posts in neighbourhood based on lighting strategy and evaluation of pilot project		$250,000	$350,000	$350,000	$350,000	$1,300,000
Information Technology Strategic Plan						**$1,345,000**
Information Technology Strategic Plan, policy development and two year check-ins	$75,000		$20,000		$20,000	$115,000
Privacy Impact Assessment		$50,000				
Information Hub technology improvements	$20,000	$60,000	$20,000		$20,000	$120,000
Capital Investment for IT Backhaul on municipal infrastructure		$250,000	$250,000			$500,000
Mesh Network lamppost technology installations			$50,000	$250,000	$250,000	$550,000
Geofencing and Beacon Technology Implementation		$25,000	$25,000	$25,000	$25,000	
WiFi hotspots	$40,000	$5,000	$5,000	$5,000	$5,000	$60,000
Electric Vehicle Penetration Action Plan						**$160,000**
EV Penetration Strategy Communications, partnership building and implementation plan design	$40,000					$40,000

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EV charging station installation equipment Capital investment for installation, operations and maintenance of electric vehicle charging stations and incentive tools as laid out in the EV Implementation Strategy Action Plan		$30,000	$30,000	$30,000	$30,000	$120,000
Ongoing Research and Engagement						**$1,225,000**
Baseline Progress Report of Sustainability Assessment of Yellowknife's performance on the UN SDGs, checkpoints and course correction reports	$50,000		$25,000		$25,000	$100,000
Research Budget Support third-party research to support Smart City Vision and IT Implementation Plan	$125,000	$125,000	$125,000	$125,000	$125,000	$625,000
Engagement Budget Implement Communications Plan and encourage engagement with targeted sectors	$100,000	$100,000	$100,000	$100,000	$100,000	$500,000
Operations & Maintenance						**$650,000**
Staff salary (1PY) for Smart Cities project management	$120,000	$125,000	$130,000	$135,000	$140,000	$650,000
	$710,000	**$1,035,000**	**$1,150,000**	**$1,020,000**	**$1,110,000**	**$5,025,000**

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CHAPTER 9

IMPLEMENTATION PHASE REQUIREMENTS

In this chapter the City of Yellowknife intends to show how it will meet requirements of applicable federal, territorial and municipal reporting and policy requirements.

DUTY TO CONSULT WITH INDIGENOUS GROUPS

The Duty to Consult with and accommodate Indigenous Peoples is required when the Crown contemplates actions or decisions that may impact treaty rights. Being a northern city with a close relationship with the Yellowknives Dene First Nation (YKDFN) with whom the City shares a border and with whom we count many shared citizens, it is critical that consultation and collaboration are consistent with the high ideals of both the Crown and the City.

To this end the City of Yellowknife is enthusiastic and proud to have YKDFN as partners in this project. YKDFN will participate in the governance of the project as part of the Smart City Committee and the community of N'dilo and Dettah will share opportunities to participate in the outcomes of the Smart City project.

The City has taken clear steps to include the YKDFN in the finalist stage of the proposal through the design charette and sharing the proposal for review with YKDFN. As a key partner YKDFN will play a key role in designing the strategies and outcomes as part of the Smart City Committee, and we anticipate showcasing YKDFN and Yellowknife history and culture in the engagement portion of the Smart Cities Implementation.

COMMUNITY EMPLOYMENT BENEFIT

Yellowknife's Smart Cities Challenge project intends to support employment opportunities for youth, Indigenous elders, artists, recent immigrants, youth and small-sized and medium-sized businesses and social enterprises. By having targeted workshops, technology based challenges, projects and contracts through the research and engagement budget, it is hoped that creative tools and engagement opportunities will encourage participation of targeted groups to build excitement and opportunities for inclusion into a Smart City. Participation will be tracked and specific engagement sessions and opportunities will be included .

Putting in place the conditions for innovation to flourish will allow for a rise in circular economy, green jobs and social innovation to take place. Turning Yellowknife into the Tourism Capital of the North will benefit all of Yellowknife and YKDFN, and the City will promote opportunities for cultural tourism. Yellowknife as a northern hub for innovation and a Smart City will set about the groundwork for a surge in small scale entrepreneurship, innovation and the knowledge economy.

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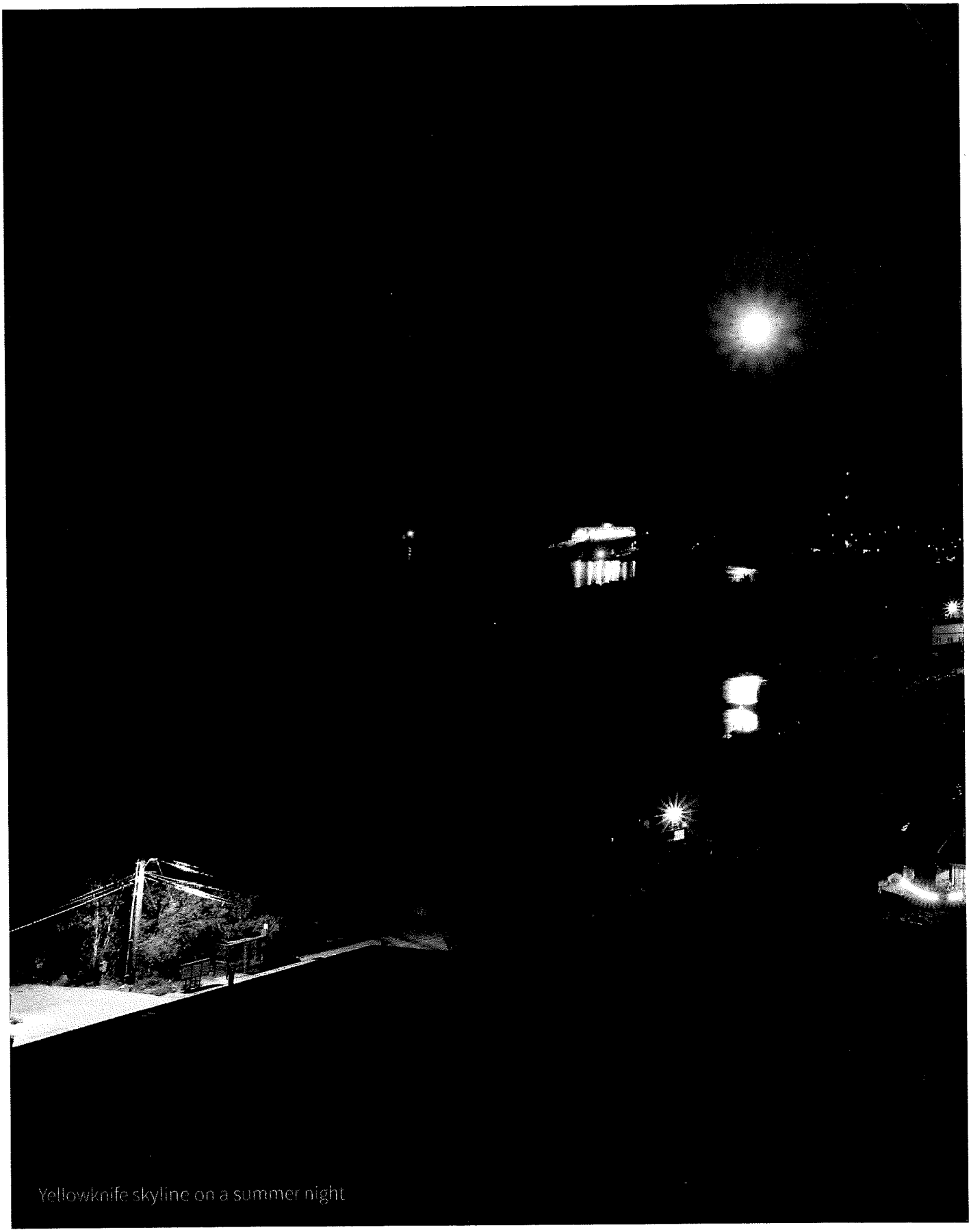
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Yellowknife skyline on a summer night

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Biigtigong Nishnaabeg
(Pic River First Nation)

Smart Cities Challenge

Final Proposal Submission

Submitted by:
The Biigtigong Nishnaabeg Smart Cities Team

On:
March 5, 2019

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Executive Summary

Canada is trying to create a smart technology future. Biigtigong Nishnaabeg First Nation is trying to revitalize their indigenous language and culture while preparing their K-12 students for the smart technology future.

By utilizing open source software and results-oriented approaches to facilitate effective online learning, effective online acquisition of their endangered Nishnaabe language, and revitalization of their culture - all as an enhancement to their brick-and-mortar K-12 curriculum delivery model, Biigtigong Nishnaabeg are transforming their youth into better-educated, more employable, better-grounded, and more holistically Nishnaabe people.

The graduates of their K-12 curriculum will be able to nearly-completely understand their Nishnaabe language (which is a first-step on the way to becoming a speaker of *any* human language), will have been educated on the interface of the their Nishnaabe worldview with the STEM subject perspectives, will have had increased involvement in real-world traditional Nishnaabe activities in the territory of the Biigtigong Nishnaabeg, will have experienced increased relationship-building with all community members especially in the context of those traditional activities, will be able to code, to build and control robots, and will have been educated in the entire exam preparation curriculum of a general-accepted best-starting point certification to enter the IT working world.

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Chapter 1: Vision

Challenge Statement Vision

Our Challenge Statement reads:

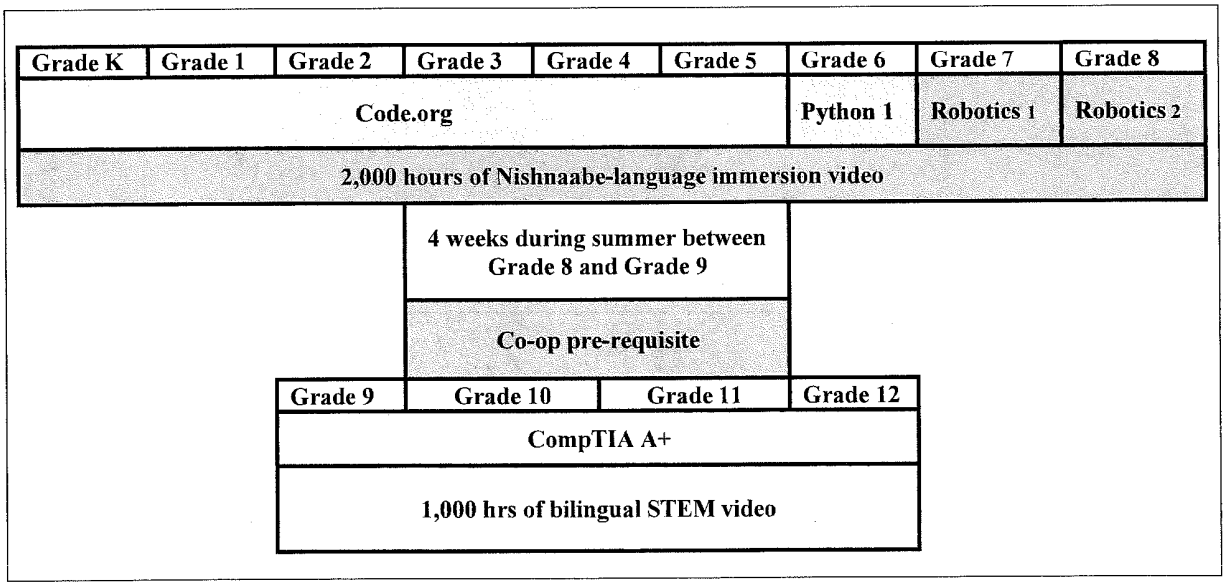
> *By means of active, cross-generational, technology-empowered, real-world participation in the intergenerational transfer of traditional Nishnaabe knowledge through the medium of our language, and the bilingual delivery of modern K-12 STEM knowledge, our community will transform our youth into better-educated, more-employable, better-grounded, and more holistically Nishnaabe people.*

Please see Figure 1-1 for a graphical representation of the "bilingual delivery of modern K-12 STEM knowledge" which we propose in our Challenge Statement.

Outcomes Produced by Carrying Out Our Vision

Our final proposal will carry out the vision of our Challenge Statement and will produce the outcomes laid out in our application.

Figure 1-1: Our bilingual delivery of modern K-12 STEM knowledge. These proposed augmentations to our current K-12 curriculum are partially rolled-out during implementation year 1*, and fully rolled-out at the start of implementation year 2.



** For a rollout schedule of each year of implementation, please see Appendix B.*

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Our final proposal seeks to achieve the four outcomes listed in our Challenge Statement:

(1) **youth who are "better-educated"** due to
   a. their having successfully completed a greater number of K-12 STEM subjects post-proposal implementation than they successfully completed pre-proposal implementation; and
   b. their increased preparedness for college and university as a result of their having successfully completed a greater number of K-12 STEM subjects post-proposal implementation than they successfully completed pre-proposal implementation;

This outcome is measurable via these progress indicators:
- Increase in number of K-12 STEM courses successfully completed by K-12 students, beyond what is currently offered in our K-12 curriculum
- Decrease in percentage of K-12 students needing remedial help in STEM subject areas

(2) **youth who are "more-employable"** in current jobs, as well as in yet-to-be-known types of STEM-related jobs, which require knowledge / expertise in the K-12 STEM subject areas;

This outcome is measurable via these progress indicators:
- Increase in number of K-12 STEM courses successfully completed by K-12 students, beyond what is currently offered in our K-12 curriculum
- Increase in number of K-12 students who have at least a basic ability to code

(3) **youth who are "better-grounded" in their Nishnaabe identity** due to
   a. their knowledge of our core aadsookaanan; and
   b. their increased participation in our community's traditional Nishnaabe activities;

This outcome is measurable via these progress indicators:
- Increase in number of K-12 students who know the key concepts expressed in each of our core aadsookaanan
- Increase in number of traditional Nishnaabe activities in which each K-12 student, on average, participates per year

(4) **youth who are "more holistically Nishnaabe"** due to
   a. their ability to nearly-completely understand our spoken Nishnaabe language; and
   b. their increased participation in our community's traditional Nishnaabe activities; and
   c. their knowledge of the roles of our Nishnaabe worldview in modern technological society

This outcome is measurable via these progress indicators:
- Number of hours of Nishnaabe language acquired by graduating eighth-graders is at least 2,000 hours
- Increase in number of traditional Nishnaabe activities in which each K-12 student, on average, participates per year
- Number of hours of Nishnaabe-language STEM video successfully completed by graduating high school seniors is at least 1,000 hours

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The way in which our final proposal carries out the vision of the Challenge Statement, achieving our four outcomes, is via the following six activities/projects:

(1) **"active participation"**

We mean active in contrast to passive, where active participation includes engaged Khan Academy-style Growth Mindset blended learning pedagogical approaches – approaches which take into account the recent discoveries on how humans beings more effectively learn knowledge in online and hybrid (online and brick-and-mortar, combined) environments; calls to real-world action on our online, mobile-enabled platform (particularly on the eLearning, eAcquisition, and meetup forum functionalities of the platform), online forums, and online community discussions; real-world, hands-on activities undertaken and completed in a group setting, our youth wrapped in the embrace of the community network; strong encouragement to attend community events, with those community events effectively and articulately made known to all community members via our online forums and discussions.

This activity/project achieves the following outcomes:

- **youth who are "more holistically Nishnaabe."** Community-engagement is a foundational component of our Nishnaabe way of living. Actively participating, not just in social activities – which are, indeed, foundationally important to community vibrancy and individual flourishing – but also being actively engaged in our own learning – both formal and informal – is a key to success in whatever role a Nishnaabe individual plays in the community. Actively participating in the whole of the Nishnaabe community is an imperatively important requisite for one's wellness as a Nishnaabe person.
- **youth who are "better-grounded" in their Nishnaabe identity.** Our Nishnaabe people cannot be only *knowledgeable* of our social norms and ways of being. This knowledge must be *implemented* in one's life in order for one to be a whole Nishnaabe person. Similarly, much knowledge can be obtained through the very act of active participation in one's community. Knowledge and active participation are thus connected. Active participation leads to knowledge. Knowledge, in turn, leads to active participation. In order for a Nishnaabe person, then, to be more knowledgeable – better-grounded – in being Nishnaabe, active participation in the Nishnaabe community is required.

(2) **"cross-generational participation"**

Cross-generational participation means not just youth/students, but community members from the entire span of ages, from all generations.

This activity/project achieves the following outcomes:

- **youth who are "more holistically Nishnaabe."** Similar to the reasons given in the above section on the active participation requisite for one's being holistically Nishnaabe, all sectors of our Nishnaabe community must have a space and a place to participate. Each age group brings a diverse set of experiences, gifts, and knowledge to our collective Nishnaabe community, and to the overall wholeness of each of the individuals within the community. The participation of everyone, from all generations, is required for each of us to be holistically Nishnaabe.
- **youth who are "better-grounded" in their Nishnaabe identity.** We Nishnaabe people believe that everyone – no matter one's age – is a teacher and a contributor to the collective's knowledgebase. Encouraging and ensuring the participation of all generations

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provides a maximally diverse dataset of experience as knowledge, made available to and learnable by each and every Nishnaabe community member who participates in community events. This cross-generational participation leads thusly to better-grounded Nishnaabe community members.

(3) **"technology-empowered participation"**

Technology-empowered participation refers to engagement with the eLearning and eAcquisition functionalities of the Open edX platform; engagement in Open edX's meetup discussion forums for traditional Nishnaabe activities; online platform discoverability of friends'/relatives' locations and currently-happening traditional activities in order to encourage students to, in like manner, take part in those made-discoverable activities.

This activity/project achieves the following outcomes:

- **youth who are "better-educated."** Knowing not just about technology, but being – and being comfortable – in a technology-oriented mindset, versed in the social expectations and norms of this modern way of interacting with our technological world is prerequisite knowledge and an imperatively important education to have. Just being able to navigate this brave new world of technology is a plus on one's curriculum vitae, and our proposal's implementation will yield for our Nishnaabe youth exactly that: a better education through the experience of successfully participating in this new technology as a means to better one's self educationally.
- **youth who are "more employable."** The technology-empowered participatory tools – the rules of online community engagement – that will benefit our Nishnaabe youth are, in many cases, the precise job skills required to even be considered for a job interview. Online forum etiquette, respecting boundaries of online relationships, being responsive to and responsible for timely replies to online community engagement requests and relationships, and a host of other modern technological communication social norms – the very skills and education that our proposal will instill in our Nishnaabe youth – are what will help prepare our Nishnaabe youth to be effectively and productively employed in today's – and the future's – job market.

(4) **"real-world participation"**

Smart technology is an enabling factor, a factor which enables real-world participation – not just online participation, but participation in the real, material world. The world of touchable human beings, hugs, babies, tears, family, and love. Our proposal intends to implement this technology to facilitate and encourage participation in real-world community events.

This activity/project achieves the following outcomes:

- **youth who are "more holistically Nishnaabe."** Being Nishnaabe means being community-oriented. Participating and being an active, contributing part of the lives of those whom we are networked within our territory is a requirement of our communal approach to effective and productive existence on this earth. Participating in the real world, the material world, of our Nishnaabe community is thus a requirement of being a whole Nishnaabe.
- **youth who are "better-grounded" in their Nishnaabe identity.** Being better grounded means being better educated. And being better educated happens, in part, by being around

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the educated and knowledgeable ones. For Nishnaabe people, all activities are a teaching opportunity – and thus a learning opportunity. Being out and about in the community leads naturally to discussions with people more knowledgeable than us, which in turn leads to becoming more knowledgeable ourselves – more educated, and thus better grounded.

(5) **"intergenerational transfer of traditional Nishnaabe knowledge through the medium of our language"**

Our proposal aims to produce 2,000 hours of Nishnaabe-language immersion video, the content of which will be our core aadsookaanan (our sacred stories, our philosophical foundations, the building blocks of our worldview). Our aadsookaanan are, in part, the imperatively important intergenerational knowledge which has been passed on – in story form – for countless generations. The acquisition – language *acquisition* (subconscious) in contrast to language *learning* (cognitive) – of 2,000 hours of a target language yields an individual who can nearly-completely comprehend that target language. The target language in this case is our Nishnaabe language, and it is with this 2,000 hours of immersion video of our aadsookaanan that we intend to create understanders of our Nishnaabe language – understanders who can then go on to successfully complete 1,000 hours of STEM subject non-immersion video (i.e., what we usually refer to in this proposal as 'bilingual STEM video'), the audio of which is delivered in our Nishnaabe language.

This activity/project achieves the following outcomes:

- **youth who are "more holistically Nishnaabe."** Being a whole Nishnaabe requires that one be a speaker of one's Nishnaabe language. While this proposal is not big enough to facilitate that particular outcome, becoming an understander of our Nishnaabe language is, indeed, attainable within the timeframe of this proposal. And, since we are aiming for "more" holistically Nishnaabe, becoming an understander of our Nishnaabe language fits the bill quite nicely. Two points here: (1) being able to understand one's indigenous/heritage language, for a member of any culture, seems obviously contributory to one's being more holistically of that culture and identity; and (2) walking around in the world with a headful of knowledge that got into one's head via a foreign language does not make for a very "holistically Nishnaabe" person. While knowledge and education are important in their own right, it is more holistic for that knowledge and education to have entered one's head in the medium of one's own indigenous/heritage language. So, our youth being able to understand our Nishnaabe language which in turn makes possible their learning content of a modern K-12 STEM curriculum delivered in the medium of our Nishnaabe language is a powerful contributor to their becoming more holistically Nishnaabe.
- **youth who are "better-grounded" in their Nishnaabe identity.** Knowing about one's cultural identity is self-evidently important to one's wholeness. But, knowing the main tenets of the core philosophies of one's culture is absolutely key to one's being well versed in the oral/written stories/literature of one's culture – especially when one considers the importance of learning this information through the medium of one's language. Learning the main ideas expressed in our Nishnaabe aadsookaanan, through the medium of our Nishnaabe language, produces Nishnaabe youth who are more knowledgeable of, thus better-grounded in, their Nishnaabe identity.

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(6) "bilingual delivery of modern K-12 STEM knowledge"

This activity/project refers to the combination of our English-language K-12 STEM curriculum and the 1,000 hours of bilingual (Nishnaabe-language and English-language) STEM video. Please see Figure 1-1 for a graphical representation of this post-augmented curriculum. Our bilingual STEM video will, in part, teach our grade 9-12 students about the role of our Nishnaabe worldview in modern technological society. In particular, our bilingual STEM video will show that there is no conflict in the explanations provided by modern-day STEM and our Nishnaabe worldview. More specifically, our bilingual STEM video will enlighten our students about the relationship between the teachings of our aadsookaanan (which we can refer to with more culturally-neutral terminology as 'allegorical narrative,' or simply 'mythology') and STEM: the role of science is to explain/show/teach what *is*; the role of mythology is to explain/show/teach *why* (metaphysically why) something is.

For example, the scientific explanation of lightning and thunder (that lightning is a huge electrical discharge that flows between clouds, from a cloud to air, or from a cloud to the ground; and that thunder is in turn caused by lightning), and our Nishnaabe worldview explanation of this same phenomenon (that thunder beings are engaged in an eternal battle with the great underwater lynx; an allegory for the eternal battle between good and bad). Only in modern times have these two traditions (i.e., mythology and science) been viewed by some as 'in conflict,' or 'in competition.' Historically, however, throughout the world's indigenous societies, at least, mythology has made science more culturally fitting – not tried to compete with, nor replace the role of, science.

Mythology has *not*, historically, tried to do the work of the STEM fields. Mythology and STEM have, historically, been partners in explaining the world around us in a culturally-appropriate – and usually quite poetic – manner. In similar fashion, this is the function of our bilingual STEM video, and the role of our bilingual delivery of modern K-12 STEM knowledge, in general: to explain the scientific, material world around us in a culturally-appropriate - and usually poetic – manner. This activity/project achieves the following outcomes:

- **youth who are "better-educated."** The need of this generation of K-12 students for a solid STEM subject area education is undeniable. One need only browse the course descriptions or syllabi of almost any college/university curriculum to find the very long list of requisite technology, math, science, programming knowledge for those majors and academic program paths. Providing our youth with thirteen years of a modern, K-12 STEM curriculum will provide them with the tools, knowledge, and mindset to succeed in the increasingly demanding curriculum of this modern technologically-driven world.
- **youth who are "more employable."** For reasons similar to the ones given in the above paragraph, our youth who have successfully completed our bilingual, modern K-12 STEM curriculum will not only be better prepared for college and university. The college and university curriculums are being designed, in part, to produce graduates who are more employable in this technologically-driven world and job market. Our youth, having completed such solid preparation as provided for them by our K-12 STEM curriculum, will thus be more employable. And, not only after college/university; but, also in the high-school graduate job market, as well.

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- **youth who are "more holistically Nishnaabe."** One's having been educated in a particular subject area is an accomplishment on its own. Having been educated in a particular subject area in the medium of one's indigenous/heritage language, with that education couched in the worldview and perspective of one's mythology and culture, is an even greater accomplishment; and, an accomplishment contributing greatly to one's wholeness as a member of that language community.

The achievement of our six activities/projects, and their consequent four outcomes, are enabled by the creation of an online, mobile-enabled platform able to carry out the following three functions. We have chosen the Open edX platform for this purpose. (While we originally envisioned having three separate platforms/applications for each of the three functions, we have, during the finalist phase, opted to wrap all three of these functions into one 'Learning Management System' (LMS) platform, namely Open edX.) Open edX is open source software and facilitates the production of materials to be made available under a Creative Commons license. The three functions being fulfilled by the Open edX platform are:

(1) **eLearning.** Mobile-enabled eLearning functionality is built into Open edX with open source technologies and languages, enabling interoperable, scalable, and replicable results by any other community or organization choosing to implement a similar platform. eLearning functionality will facilitate the collection of real-time data on all aspects of community-based, online, collaborative learning, and the storage of that data in an open source database backend enabling other departments and organizations within our Biigtigong Nishnaabeg community to seamlessy access and utilize this data.

(2) **eAcquistion.** Mobile-enabled eAcquisition functionality will be nearly identical to our eLearning functionality, but will have the added responsibility of enabling the effective acquisition of our Nishnaabe language. As our community makes a strong distinction between language *learning* (a conscious, cognitive process) and language *acquisition* (which occurs subconsciously), we need to keep these two functionalities independent of each other so that each one's unique pedagogical approach can be implemented effectively.

(3) **meetup forum.** Mobile-enabled meetup forum functionality will serve as the central 'online gathering' place which will facilitate the bridging and interfacing of the digital world with the material, real world. All community members will have access to each other via this online gathering place. This functionality within Open edX is where our youth who are hoping to attend a particular traditional Nishnaabe activity can express their interest to do so. Other community members then have the ability to invite our youth along to that event. Likewise, community members who are planning an activity can now express their intentions in the meetup forum functionality of Open edX thereby providing additional options for our youth to take part in while remaining in the embrace of the real-world community network.

Data: Outcomes are Reflective of True Needs of Community

Our outcomes are reflective of the community needs. We conducted extensive community engagement sessions throughout the development stage of our proposal. These sessions were aimed at specific stakeholders and the community at large, including our off-reserve members. Through presentations, discussions, surveys, small group meetings, family meetings, luncheons, social events, we successfully engaged a large number of our community. 221 unique members attended at least one of our engagement sessions and 121 individuals completed our extensive community survey. Chapter 6 provides the findings from our engagement sessions and how community input improved our proposal.

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Outcomes are Ambitious and Achievable

Firstly, there exist extremely high unemployment rates for our youth, independent of industry. When we consider only the STEM fields, these unemployment rates for our youth are absurdly high. Our proposal will help to alleviate this.

Secondly, this proposal will move Nishnaabe people from being mainly passive consumers of technology to being active, effective STEM-educated administrators, managers, and users of data and connected technology who are able to achieve meaningful outcomes for themselves, their community, and other communities.

Thirdly, our outcomes are ambitious because we, similar to other Nishnaabe/indigenous communities, have only one high-proficiency first-speaker of our dialect. A survivor of the Canadian Indian residential school system, she is 82 years old. We have only another two medium proficiency first-speakers of our dialect. They are both in their 70s. When they leave, so will our dialect.

So, over the last five years, we have been hurriedly working with a high-proficiency second-language speaker of a related dialect. He has spent the last five years working with our elders to reconstruct our dialect. (Our Biigtigong dialect's noun declension charts, verb conjugation charts, and dictionary are all currently available on our language website, biigtigong.com, under a Creative Commons license). He is now able to 'grammar bridge' into our Biigtigong dialect from the dialect which he originally acquired; he is thus able to speak and write in our Biigtigong dialect. It is his Nishnaabe-language audio which will be heard on all 3,000 hours of video which our proposal aims to produce.

It is important for us to note here that the method which he used to become a speaker of the Nishnaabe language – he began acquiring the Nishnaabe language almost 20 years ago when he was in his 30s – is the very method of second language acquisition that we're using in our proposal to transform our Biigtigong youth into understanders of our dialect.

Whether we consider the Royal Commission on Aboriginal Peoples, the work of the Truth and Reconciliation Commission, the United Nations Declaration on the Rights of Indigenous Peoples, or that the United Nations General Assembly has declared 2019 the International Year of Indigenous Languages (IYIL2019), we have before us – "us" being Canada and we Biigtigong Nishnaabeg – an ambitious *opportunity*, indeed. An opportunity to move forward. Together. As partners. Collaboratively, we can produce the means by which Nishnaabe people can *forever* be able to become understanders (on their way to becoming speakers) of the Nishnaabe language. That's pretty ambitious.

Our outcomes are achievable because a community such as ours, Biigtigong Nishnaabeg, who has for many, many generations been healing, repairing, reconstructing, and unendingly facilitating the education and holistic Nishnaabe being of each and every one of our community members, as a collective unit, as a community, is quite the solid foundation on which to implement this proposal. The outcomes sought by this proposal are quite achievable, indeed.

Outcomes are Meaningful for the Community and Residents

Our proposal has been met with overwhelming support from our community since the very start of our Smart Cities journey. Biigtigong Nishnaabeg has been working on the revitalization of our language and aadsookaanan many years before we started work on this Smart Cities Challenge. Our Smart Cities final proposal further facilitates profoundly meaningful goals of the community which were set in motion decades ago.

support long-term project

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Our chief, Duncan Michano, has, for many years, shared with a great number of people his vision of educating our youth in the ways of physics, engineering, quantum mechanics, computer science, and coding. There has been a marked increase in the community's excitement around these conversations in the last four or five years in particular. Especially for our young Nishnaabe people. (For example, we already have elementary school-age kids in our community who have gone off to earn a certificate in LEGO Robotics and Programming offered by the Digital Media Academy at University of Toronto.)
Our children and youth have always been the center of our Nishnaabe society. They are, in a very real way, our future. They carry our entire ancient past, and our ongoing present, into the unknown, the future. It is difficult for our community to imagine something *more* meaningful than the betterment of our youth in this modern technological society while helping them to carry with them, as they move forward into the future, our Nishnaabe language and our Nishnaabe worldview.
The outcomes of our final proposal are, *indeed*, meaningful for our community and our residents.

Our Proposal is Well-Suited to a Smart Cities Approach

Our proposal is very well-suited to a smart cities approach.

Smart Cities Approach Principle: Openness

By making our language accessible for the first time through an online platform that can be accessible by anyone at anytime. We will also provide a model for integrating immersion education and STEM education into a standard curriculum. K-12 STEM learning can augment immersion-based cultural learning and immersion-based cultural learning can augment K-12 STEM learning.

By preserving as *open* data, a subset of our language in a certain format (i.e., in the format of *understandable* language which is able to produce understanders of our language after 2,000 hours of viewing), we not only facilitate the survival and thriving of our language into the future, we are also providing a model for other First Nation communities – as well as other communities and groups – to do the same. This initiative will strengthen the relationship between residents and government and public organizations and will help to fulfill Canada's goal of reconciliation with First Nation communities.

Smart Cities Approach Principle: Integration

Currently, our language and aadsookaanan are at risk of being lost. Through the use of connected technology, and by recording this data – including much of our raw cultural data being preserved/made-available on Open edX – we are ensuring that our community knowledge is maintained for our Biigtigong Nishnaabeg generations to come, for the benefit of Canadians, and for the benefit of the world. By this democratization of cultural knowledge, we are thus breaking down silos that exist even in our traditional societal structures. Similarly, modern-day administrative and learning management roles of K-12 teachers, of parents, of elders, and of governmental leadership, are also all further facilitated by the increase in frictionless availability of data made possible via the removal of data silos.

Smart Cities Approach Principle: Transferability

We have provided an open source, standardised, and transparent approach to integrating immersion-based cultural education and STEM education into any school curriculum - all of the videos we are producing can be overdubbed in any other language. The approach to building community capacity, through embracing language, culture and STEM can be replicated across the country regardless of a community's size or resources.

This approach is not limited to one language only. The language in question could also be Cree, Mohawk, French, or Italian, for example. There may be a need across the board - in perhaps most, or even all,

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cultures - to augment STEM learning with language-based cultural education; a need to combine, merge, and interface the digital connections with physical community. In our approach in this proposal, the meetup facilitation functionality of Open edX achieves this. Our proposal moves us into the future by embracing and continuing to facilitate the merging of the digital-world and the real-world in order to create a *truly* smart city that uses data, digital connection, and an online platform to enable intergenerational transfer of knowledge – both traditional language and STEM knowledge and education – education to create better-educated, more employable, better-grounded, and more holistically Nishnaabe(in our case) people.

Our approach is suitable for communities of any size, any location, any level of resources, and is easily replicable and scalable. We see our proposal as an ideal 'onboarding' approach for any community – almost regardless of access to technology-trained staff – to a more STEM-infused culturally-based/appropriate/infused community. Implementing the bleeding-edge STEM technologies – as a first step - is not, in our opinion, viable for many communities.

The approach we are taking – and advocating for – in our final proposal is not unlike the strategy of early-years Netflix as that company disrupted the DVD-rental industry. Netflix's secret weapon in their successful venture? The post office! Not the most modern of 'technology,' to say the least. While Netflix, of course, employed a host of other approaches and tactics, beyond its utilization of the post office, the company's achieved outcomes are still remarkable given the common 'technology' they employed. We view our smart cities final proposal in a similar light. We have deliberately chosen to deliver *bleeding-edge, four-star quality* outcomes by utilizing *common* smart technology, instead of delivering *common* outcomes by utilizing *bleeding-edge, four-star quality* smart technology. We believe that this approach will maximize the replicability of our approach - and the spread of smart technology - across Canada.

Our proposal is an onboarding approach to smart cities. Not every community has the resources, staff, equipment, Wi-Fi access, etc. to implement cutting-edge smart technology. There is a need to build STEM *knowledge* first, through the method developed in our proposal. What good are sensors and data collection if we do not have the knowledge and appropriate cultural lenses to extrapolate meaning from them? Creating a digitally-literate population is, in our opinion, absolutely essential to ensuring long-lasting smart cities - not just a fad technology that is used for a short period of time.

Lasting and impactful community change, through STEM education, and reconnection with culture through language, along with the use of common, newbie-friendly smart technology is of key importance in the overall strategy of facilitating transferability. Our approach to integrating STEM education into a K-12 curriculum is, indeed, transferable; it can be implemented in any school across the country.

Smart Cities Approach Principle: Collaboration

This technology will enable cross-generational and cross-cultural collaboration as we build a future of digitally-literate and more culturally whole youth who will lead the smart cities of tomorrow across Canada.

Progress During Finalist Phase

Progress toward our outcomes has already been achieved during the finalist phase. We:

- organized and facilitated community consultation events, each with a particular community sector focus
- implemented some changes in organization structure: established teams, roles and responsibilities, etc.

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- begun several pilot projects: story writing; aadsookaanan reconstruction; and Waawaa video production
- utilized community surveys to determine several baselines
- set up a framework for data collection and baseline measurement of progress
- produced prototypes of immersion video overdubbed with audio of Biigtigong's dialect
- developed some tools to assess staff training needs
- researched approaches to and formalized a framework for the reconstruction of our aadsookaanan
- successfully piloted Makey Makey, Scratch, and Code.org at our elementary school
- formalized our partnerships
- continue our community engagement sessions with our off-reserve and on-reserve members
- pilot with our elementary school staff and students a sampling of online classes
- further develop the interfacing of our Nishnaabe approach to learning and the Growth Mindset Approach
- continue 'Waawaa' immersion video production, evaluation, and instructor professional development

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Chapter 2: Performance Measurements

Strategy

An outcome-based performance approach is a results-based management tool that can be used to guide the selection, development and ongoing use of performance measures. For this project, this strategy will be adopted, which will enable the project team to continuously monitor and assess the results of programs as well as make informed decisions and take appropriate mitigation actions should they be required. A success outcome-based performance measurement strategy will also provide effective and relevant departmental reporting on the program and ensure that credible and reliable performance data is being collected to effectively support evaluation.

Approach

The key to achieving the desired outcomes of this project is to set clearly defined goals which are achievable for the timeline of this project. This will involve defining metrics that can be set to clearly measure the project's success, as well as to identifying any deviations which can then be quickly remedied. The metrics to be used for this project will follow the SMART methodology for goal setting, as defined below:

1. The set outcomes of this project are ***Specific***
   The desired outcomes for this project are clear, well defined and based upon the specific requirements for the completion of this project.

2. The set outcomes of this project are ***Measurable***
   Metrics have been developed to measure the progress of this project. The project team will use these metrics to assess levels of project completion and identify any deviations.

3. The set outcomes of this project are ***Achievable***
   The set outcomes of this project were developed by assessing and interpreting relevant data and by receiving input from various experts in relevant fields.

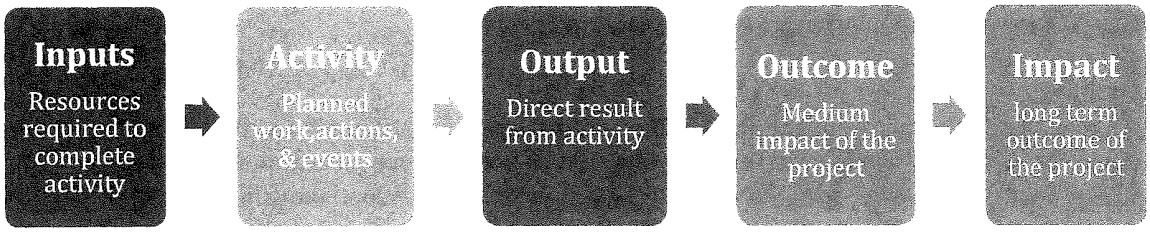
4. The set outcomes of this project are ***Relevant***
   The defined outcomes of this project are essential for the overall success of the project and were developed by pinpointing the specific needs of the project and by having discussions and input from stakeholders.

5. The set outcomes of this project are ***Time-Bound***
   The outcomes of the project have set target dates for completion based upon required inputs, activities and outputs.

Logic Model for Performance Measurement

A basic logic model will also be used to understand the process of measuring each metrics' impact throughout the project. As shown below performance measures can be depicted linearly, however, it is important to note that for each input and relative activity there will be short, medium and long-term results.

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As part of developing our measurement approach, the project team completed a resource assessment which has resulted in the identification and classification of the project's inputs. The project team has also developed an implementation plan for the activities required to achieve the desired outcomes and impacts. Each of these activities has an associated immediate output which will then result in the desired outcomes and impacts that are essentially the goals of our project. Further details on the aforementioned activities (resource assessment, implementation planning, and objective/outcome setting) are included in the Project Management Plan, presented in Chapter 3. The project specific components of the above logic model are summarized in the following sections:

Inputs:

Project Inputs can be defined as financial and non-financial resources used to complete project activities, produce outputs and achieve outcomes. Our project inputs include, but are not limited to, the following:

- Project team members (Chief and Council, Elders, Subject Matter Experts, Project Manager)
- Teaching Staff
- Procured software and technology (i.e. code.org curriculum, Open edX platform, etc.)
- Financial Contributions

Activities:

Project activities can be defined as the planned work, actions, and events that our project team will undertake to produce one or more outputs. The activities to be undertaken as part of this project include:

- Record written aadsookaanan (sacred stories)
- Produce Waawaa video
- Overdub videos in second language (Nishnabeweemen)
- Produce STEM videos
- Implement K-12 curriculum augmentation
- Upload all data and materials on Open edX

Outputs:

Outputs can be described as the direct result of the planned activities.

- Record of aadsookaanan (sacred stories)
- 2,000 hrs of immersion video
- 1,000 hrs of STEM video
- STEM curriculum framework and materials

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- Digitized publicly accessible version of the above.

Outcomes:

Outcomes can be described as the medium-term impact of the project.

- Increase in number of K-12 STEM courses successfully completed by K-12 students,
- Decrease in percentage of K-12 students needing remedial help in STEM subject areas
- Increase in number of K-12 students who have at least a basic ability to code
- Increase in number of K-12 students who know the key concepts expressed in each of our core aadsookaanan
- Increased annual participation rate in number of traditional Nishnaabe activities for K-12 Students
- Minimum 2,000 hours of Nishnaabe language acquired by graduating eighth-graders
- Minimum 1,000 hours of Nishnaabe-language STEM video successfully completed by graduating high school seniors

3k hrs / 9 yrs (K-8)
= 222 hrs/yr
= ~~fff~~
~ 1-1.5 hrs/day
in a 200 day school year.

Impact:

Impacts can be described as the long-term outcome of the project. For the Biigtigong Nishnaabeg Smart Cities project this includes impacts to our community as well as to society as whole, as described below:

Community Impact:

- Youth who are "better-educated"
- Youth who are "more-employable"
- Youth who are "better-grounded" in their Nishnaabe identity
- Youth who are "more holistically Nishnaabe"

Social Impact:

- Preserved language
- Preserved cultural teachings
- Model for connecting STEM, and traditional/cultural learning
- Onboarding approach to creating Smart Cities regardless of current resources or capacity.

Indicators & Milestones:

Key Performance Indicators (KPIs) allow project managers to gauge whether the planned activities have been successful. This is measured by how well they have been able to meet the objectives of the project. The four (4) main objectives for the project have been outlined in Chapter 3. The completion of the activities outlined in the implementation plan for this project should satisfy the objectives of the project and should bring tangible value added to the community and society as a whole.

It is important to have both qualitative and quantitative indicators for tracking, measuring and evaluating performance, to capture the holistic perspective of the project goals. It is also important

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to select a reasonable number of indicators to ensure that performance measurements are met and accomplished, while not over specifying and removing opportunities that may evolve throughout the project lifecycle.

Quantitative Key Performance Indicators (KPI):

The following section outlines some of the KPIs identified for the performance measurement process of our project. This section details the KPI, the data source and associated responsible resource. The table following this section summarizes this information in the context of associated outputs, outcomes, and target completion dates.

1. Number of aadsookaanan lessons created
2. Number of hours of video produced
3. Number of courses for which curriculum is implemented

The above KPIs are designed to track performance with respect to the outputs for this project. Data will be provided in the form of a summary report to be submitted by the SMEs to the project manager who will then report to the advisory committee on a biannual basis.

4. Number of K-12 STEM courses successfully completed by K-12 students
5. Percentage of K-12 students needing remedial help in STEM subject areas
6. Number of K-12 students who have at least a basic ability to code
7. Number of K-12 students who know the key concepts expressed in each of our core aadsookaanan
8. Annual participation rate in number of traditional Nishnaabe activities for K-12 Students

Qualitative Key Performance Indicators:

1. Teacher feedback and opinions
2. Student feedback and opinions

Other Key Performance Indicators

In addition to the specific KPIs that the project team has identified for tracking performance on specific project outputs and outcome, all outputs will also be evaluated through implementation of financial- and schedule-based KPIs. Financial- and Schedule-based KPIs for reporting on outcomes are less reliable and therefore these KPIs will only be associated with the following project outputs:

1. Estimated Budget vs. Actual Expenditures (Financial)
2. Target Completion Date vs. Actual Completion Date (Schedule)

Source of Data and Reporting Role and Responsibilities

With respect to tracking the Key Performance Indicators listed above, much of the data required including; participation rates, hours of aadsookaanan and STEM video developed, student grades etc. can be collected directly from the open-source online Open edX platform. Clear and concise

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reporting of the Key Performance Indicators will also be a vital component when measuring the progress made throughout this project.

Since teaching staff will be responsible for the direct oversight of student's engagement with the curriculum (i.e. Grading), they will play a large role in assessing and reporting on the performance of students and the quality of educational materials developed. Reporting of these performance indicators will then be communicated to the project team for further analysis.
The project team will be responsible for tracking their internal performance, regarding budgeting and scheduling.

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Program Outputs and Outcomes	Indicator	Data Source	Frequency	Baseline	Target	Date to Achieve Target	Data Collection Resource
Output 1 Record of aadsookaanan (sacred stories)	# of aadsookannan lessons created	Report from Elders and Project Team	Bi-annually	0	50	August 2024	SMEs – Elders &Project Manager
Output #2 – Immersion Video	# of hours of video	Report from Video Production Team	Bi-Annually	0	2,000 hrs	August 2024	SMEs - Video Production Team & Project Manager
Output #3 – Billingual STEM Video	# of hours of video	Report from Video Production Team	Bi-Annually	0	1,000hrs	August 2024	SMEs - Video Production Team & Project Manager
Output 4 - STEM curriculum framework and materials for k-12	# of courses for which curriculum is implemented	Teaching Staff and SMEs	Bi-Annually	No Grades	Grades K-12	August 2024	Teaching Staff
Outcome 1: Youth who are "better-educated"	• # of K-12 STEM courses successfully completed by K-12 students • % of K-12 students needing remedial help in STEM subject areas • Teacher opinion (qualitative) • Student opinion (qualitative)	Summary Report from Teaching Staff	Bi-Annually	None	Increase	August 2024	Teaching Staff
Outcome 2: Youth who are "more-employable"	• # of K-12 STEM courses successfully completed by K-12 students • # of K-12 students who have at least a basic ability to code • Teacher opinion (qualitative) • Student opinion (qualitative)	Summary Report from Teaching Staff	Bi-Annually	None	Increase	August 2024	Teaching Staff
Outcome 3: Youth who are "better-grounded" in their Nishnaabe identity	• # of K-12 students who know the key concepts expressed in each of our core aadsookaanan • Annual participation rate in number of traditional Nishnaabe activities for K-12 Students • Teacher opinion (qualitative) • Student opinion (qualitative)	Summary Report from Teaching Staff	Bi-Annually	None	Increase Reach and obtain Positive Opinion Feedback	August 2024	Teaching Staff
Outcome 4: Youth who are "more holistically Nishnaabe"	• Minimum 2,000 hours of Nishnaabe language acquired by graduating eighth-graders • Annual participation rate in number of traditional Nishnaabe activities for K-12 Students • Minimum 1,000 hours of Nishnaabe-language STEM video successfully completed by graduating high school seniors • Teacher opinion (qualitative) • Student opinion (qualitative)	Summary Report from Teaching Staff	Bi-Annually	None	Increase Reach and obtain Positive Opinion Feedback	August 2024	Teaching Staff

*All outcomes will also be subject to the financial and schedule based KPIs as described in this chapter and the proposal in general.

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Payment Schedule

Understanding that the intent is to develop an outcome-based contribution agreement with Infrastructure Canada, where payments will be triggered by the successful achievement of progress toward outcomes, we have developed a payment schedule that is simple, manageable and associated with the completion of milestones as outlined in detail in Chapter 8.

Risk Management

Identifying risks that may be presented throughout the project lifecycle is an essential component of project management as it allows the project team to proactively establish mitigation strategies to effectively minimize the impact of the risk on the project before it occurs. The table below summarizes a list of potential risks related to the above Key Performance Indicators, as well as the associated mitigation strategies that will be implemented to ensure that the delivery of this content remains effective, up to date, and on schedule.

Risks	Mitigation Strategies
Lag in completing activities could negatively impact project outcomes	Project implementation plan includes Ramp-Up strategy to capitalize on efficiencies in activities
Lack of Student Participation	Incorporation of Immersion and STEM education into existing curriculum provides double-duty lessons to ensure student involvement
Difficulty with Curriculum Implementation	Ramp-up capabilities of Code.org (for example) means that students can be exposed to coding in Grade 5 only, and still proceed to Python in Grade 6, and Robotics in Grades 7 and 8. In other words, the first few years of K-5 curriculum implementation has a significant buffer to include all experience and skill levels. With respect to Grade 6 and above, and experience or previous coding exposure is an improvement on the current curriculum. By the end of the 5-year implementation period, it is expected that any obstacle associated with curriculum implementation will be overcome.
Resources (Human or Technological) are no longer available	Only a few language speakers and Elders can produce aadsookaanan. This highlights the critical nature of this project. The likelihood of any human resources no longer being available is very low, but the impact if this is the case would be significant.
Curriculum becomes outdated	Reliance will be placed on existing websites for STEM education (i.e. code.org). As these are established organizations, that are constantly updating and revising content to better engage youth and other users in this field, there is little chance that this curriculum will become dated. However, SMEs will continuously monitor content and explore alternatives should the desired content become outdated or unavailable.

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Chapter 3: Project Management Plan

Introduction

A Project Management Plan (PMP) is used to manage the implementation of a project through the formal documentation of any actions necessary to define, prepare, integrate and coordinate the various project activities. The PMP defines how the project will be executed, monitored, controlled, and closed. Project Management is an iterative process and as such, the PMP acts as a living document, which is progressively elaborated upon throughout the course of a project. As part of the finalist stage, our project team has developed a Project Management Plan (PMP) for the implementation phase of the project that includes the following:

1. Project scope, scheduling, sequencing, and dependencies
2. Resource assessment, including human, material, and financial (e.g. workforce capacity, infrastructure readiness, and related initiatives already underway) that are sufficient and appropriate to the achievement of outcomes
3. Strategies for: Risk identification and appropriate mitigation
    a. Procurement, including alignment with technology and partnership requirements
    b. Stakeholders, including analysis of impact and influence
    c. Communications, including strategies that promote community involvement and transparency and tailor to diverse stakeholders and projects
4. Monitoring, controlling, and reporting strategies and checkpoints for contingencies and course corrections, if necessary
5. Approach to sustaining projects beyond the lifecycle of the Challenge.

The following chapter summarizes our team's Project Management Plan, with reference to the appropriate chapter of the proposal that will provide supplementary information. When proceeding with the project, the information contained within this proposal will be restructured to serve as the various project management materials needed to guide the project team through the implementation of the project and beyond.

Project Scope, Scheduling, Sequencing & Dependencies

The scope of our project includes the development of 2,000 hours of Nishnaabe-language immersion videos, the content of which will be our core aadsookaanan (our sacred stories, our philosophical foundations, the building blocks of our Nishnaabe worldview). It is intended that this will create understanders of our Nishnaabe language who can then go on to successfully complete an additional 1,000 hours of STEM educational video, the audio of which is delivered in our Nishnaabe language. It is worth reiterating that the model being developed can be used for any other language or culture, the idea is to blend STEM education with tradition, to create leaders of tomorrow with a strong connection to their traditions and cultures. For example, the WaaWaa videos can be overdubbed in any language and be just as useful. It is our belief that this is truly a Canadian approach to developing Smart Cities.

This project will move Nishnaabe people from being mainly passive consumers of technology to being active, effective STEM-educated administrators, managers, and users of data who are able to achieve meaningful outcomes for themselves, their community, and other communities. Upon completing high school, our youth will have received more than 2,000 hours of mobile-enabled,

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online Nishnaabe-language immersion instruction in all of our core aadsookaanan (our sacred stories, our philosophical foundations, the building blocks of our Nishnaabe worldview).

Additionally, our youth will be nearly-completely able to comprehend spoken Nishnaabemwin, will have attained a basic proficiency in coding and robotics, and will possess a strong foundation in mathematics and science. All STEM subject videos and courses will be available under a creative commons license, in both Nishnaabemwin and in English. All of this education will occur in a blended-learning environment with a strong real-world participation component built into the program. The eLearning functionality of our community's open source, mobile-enabled, Learning Management System (LMS), Open edX, facilitates the learning of the STEM subjects. And, the eAcquisition functionality of Open edX facilitates the acquisition of our Nishnaabe language. The entire educational experience is tied together with the meetup forum functionality of Open edX serving as a bridge between the digital, online world and the material, real world. Our youth are strongly encouraged and empowered to participate not only in online communities, but in the traditional Nishnaabe activities going on in the real-world community thereby bridging the gap between the online and real world. Based on this scope of work, the following project management plan has been developed to guide the project team through the implementation phase and beyond. This planning template can also be utilized by other communities when adopting our onboarding approach to a smart city.

It should be noted that this PMP is based on our approach to develop a smart city through the integrated delivery of our culture, language and STEM education; however, other communities that choose to replicate this approach will be able to tailor their project to reflect their culture and language. The products and outcomes of our project, including templates, videos, and curriculum will be made readily available in an open source and transparent format, to be accessed by any community wishing to replicate our approach to developing a smart city.

Project Objectives:

As previously mentioned, our project seeks to achieve the four (4) objectives or outcomes, listed in our Challenge Statement. These objectives are summarized below but are presented in more detail in Chapter One (1), Vision.

Objectives and Measurable Outcomes:

Objectives		Progress Indicator/Measurable Outcome
1.	Youth who are "better-educated"	• Increase in number of K-12 STEM courses successfully completed by K-12 students, • Decrease in percentage of K-12 students needing remedial help in STEM subject areas
2.	Youth who are "more-employable"	• Increase in number of K-12 STEM courses successfully completed by K-12 students, • Increase in number of K-12 students who have at least a basic ability to code
3.	Youth who are "better-grounded" in their Nishnaabe identity	• Increase in number of K-12 students who know the key concepts expressed in each of our core aadsookaanan

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		• Increased annual participation rate in number of traditional Nishnaabe activities for K-12 Students
4.	Youth who are "more holistically Nishnaabe"	• Minimum 2,000 hours of Nishnaabe language acquired by graduating eighth-graders • Increased annual participation rate in number of traditional Nishnaabe activities for K-12 Students • Minimum 1,000 hours of Nishnaabe-language STEM video successfully completed by graduating high school seniors

Scheduling, Sequencing and Dependencies:

To ensure smooth project delivery, project management tools must be implemented. These tools allow the Project Team to understand each task at hand and the relationship, or interdependencies, that they share in reaching project completion. Dependencies show relationships between successive tasks and outline what tasks must be completed prior to beginning another. Using dependencies enables the Project Team to establish a critical path for the project; highlighting key events that must be met to drive the project to completion. This critical path will be depicted visually in the form of a Gantt chart.

Often dependencies result from working with different internal and external stakeholders and, as a result, it is important to establish dependencies before project commencement. As dependencies increase the risk associated with project roll-out, a number of tools and techniques can be initiated to mitigate the effects that they may have.

As a starting point, internal and external dependencies have been considered to determine associated levels of risk. Please refer to subsequent sections and chapters for descriptions of associated risks. Likewise, the project implementation plans for all project components, presented in Appendix A & B, also show dependencies between activities. The Project Team have been, and will continue to be, assigned to specific tasks and respective dependencies. As the project moves forward, it is likely that further dependencies and subtasks will take form. To ensure the timeline is not affected by these changes, Bi-Monthly Project Team meetings will take place to proactively coordinate around these obstacles and re-establish the critical path. These meetings will be identified in the project schedule.

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Project Components:

There are four main parts of this project, all to be hosted on the Open edX learning management system:

1) E-Learning, K-12 curriculum augmentations
2) Meetup forum real-world connections
3) eAcquisition, 2,000 hours of immersion video
4) Bilingual STEM video - 1,000 hours of STEM course video

1) E-Learning, K-12 curriculum augmentations

With respect to the augmentations to the existing curriculum, the project team has developed a detailed implementation plan to complete the following:

1) Implement code.org curriculum in grades k-5
2) Implement python curriculum in grade 6
3) Implement Robotics curriculum in grades 7 and 8
4) Implement CompTIA A+ curriculum in grades 9-12

The project team will rely on existing and proven curriculum for the implementation of the k-12 augmentations. Teachers will be required to incorporate these curriculum augmentations as part of their existing lesson planning process. All curriculum will be implemented via blended learning and growth mindset approaches.

In terms of the implementation schedule, the selected curriculum of code.org (for example), was selected as it provided "ramp up capabilities" meaning that kids being introduced to this curriculum for the first time in grade 5 will be able to complete "ramp up lessons" given that they did not have exposure to the K-4 curriculum. Similar, the 5-year implementation schedule for all other grades and curriculums will follow as similar approach, where necessary.

Please refer to Appendix B for additional information regarding our project implementation process, timelines and outputs for eLearning, K-12 curriculum augmentations project components.

2) Meetup forum real-world connections

The Meet-up functionality of the Open edX platform will enable students and community members to not only connect with the digital community, but also the real-world community, as well as the land and traditional activities. This mobile-enabled meetup forum functionality, provided by Open edX, will serve as the central 'online gathering' place which will facilitate the bridging and interfacing of the digital world with the material, real world. All community members will have access to each other via this online gathering place. This functionality is provided directly within Open edX and will provide our youth the opportunity to express their desire to attend a particular traditional Nishnaabe activity. Likewise, community members who are planning an activity will be able to express their intentions in the meetup forum functionality of Open edX, thereby providing additional options for our youth to take part in while remaining in the embrace of the real-world community network. As this is a function of the Open edX Platform, implementation

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will be relatively simple, requiring the development and provision of instructions to participants and encouraging participation, as part of our overall implementation strategy.

3) eAcquisition and 4) Bilingual STEM course video

With respect to the eAcquisition immersion video and STEM course videos, the project team has developed a detailed Implementation Plan to complete the following:

- Reconstruct and write our core aadsookaanan
- Produce Waawaa video (2,000 hrs)
- Overdub Waawaa video and/or produce Nishnaabe-language immersion video (live-action or 2D-animated)
- Produce bilingual (Nishnaabe-language and English-language) STEM video (1,000 hours)

Please refer to Appendix A for additional information regarding our project implementation process, timelines and outputs for the eAcquisition and Bilingual STEM Course Video project components.

To summarize, the approach taken in terms of the production of the Waawaa video and Nishnaabe language immersion video and bilingual STEM videos has been to intentionally ramp up production over the course of the 5-year project implementation. The reason for this is to allow for review and critique of the first round of videos to allow the project team to adjust course and make any improvements, as deemed necessary. Likewise, it is anticipated that the production of Waawaa videos will become more effective over the course of the project implementation plan, and therefore our team will be able to increase output over the duration of the project.

Based on our pilot studies we have identified that the level of effort to produce one hour of Waawaa video (not including overdubbing) can vary significantly. We have developed our scheduling and implementation plan with sufficient buffer and a ramp up timelines to mitigate this scheduling risks.

Implementation Plans – Strategy

These implementation plans have been developed through reliance on the Project Sponsor and Subject Matter Experts. Project Participants shall follow the implementation plan and schedule. The efficacy of the implementation strategy will be reviewed at each Bi-annual Advisory Team meeting. Should significant issues be encountered during implementation, the project participants shall notify the project manager who can call an ad-hoc advisory team meeting to review the plan and make any necessary course corrections.

Gantt Chart

A detailed Gantt Chart outlining each stage of the project, and all project participants and stakeholders, will be revisited and updated throughout the project lifecycle to ensure smooth transitions between project phases. A Gantt Chart is a PM tool that can be used to summarize critical stages of the project, dependencies and anticipated duration of tasks, as well as providing an effective resource for tracking progress throughout the project lifecycle. Gantt Charts show the progression and duration of tasks while also showing dependencies of different events within the project. This schedule will be reviewed with the Project Team before project commencement and regularly reviewed and revised as necessary to avoid schedule slippage, reduce redundancy in effort, and expedite successful project delivery.

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Resource Assessment

As part of the Project Management Plan, it is necessary to assess the availability and capacity of resources to ensure they are sufficient to achieve outcomes of the project. Biigtigong Nishnaabeg has been developing our internal resources over several years, which has enabled us to be in a position where we can achieve the goals and outcomes of this proposed project. The resources identified as required to complete this project include:

- Human resources with expertise in areas of language, technology, culture (elders), finances, education
- Technological/material resources
- Capacity building and related initiatives
- Financial resources

Human Resources

Human resource management is key when implementing a project as this dictates the connection between the available workforce and the ability of a project's strategies, objectives and goals to be achieved. The best practice for human resource management can be understood through the following six steps;

1. Develop and Revisit project objectives
2. Assess existing capabilities and capacities
3. Estimate future HR requirements
4. Determine job and resource requirement
5. Implement a Human Resource Management Plan
6. Evaluation and corrective action

This non-linear process will be implemented by our team in completing the project and each phase can be revisited as needed, and at minimum at our Bi-Annual meetings.

The Human Resource Management Plan will be used to provide guidance on how team members will be defined, staffed, managed, and eventually released throughout the project lifecycle. Each member of the team will be assessed based on the following:

- **Role** – function assumed by person on project.
- **Authority** – right to apply resources, make decisions, sign approvals, etc.
- **Responsibility** – duties of work on project team
- **Competency** - skill and capability required to complete assigned activities.

One tool that will be developed is a Responsibility Assignment Matrix (RAM). This method of project management assigns specific actions to each member of the team. Organizing the responsibilities of the team members in a RAM will allow for more organization and can be used to identify a gap in the project team's ability to complete tasks.

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Project Roles & Responsibilities

We have secured the necessary human resources for the successful development and implementation of this project. Biigtigong Nishnaabeg has a strong talent pool and exceptional human resources committed to this project. Broadly this includes

- Community leadership (Chief and council)
- Subject Matter experts
    - (in areas of language, culture and STEM)
- Technical staff
- Administrative support (finalizing)

Current key human resources are identified in the table below:

Role	Participant(s)	Responsibilities
Project Sponsor	Chief & Council	• Represent community • Provide project oversight and guidance • Review/approve some project elements
Subject Matter Experts	• Language consultant • Elders • Industry Partners • Teachers	• Provide language expertise • Provide cultural expertise • Provide Curriculum Expertise
Advisory Committee	Community and Industry Leaders	• Approves major funding and resource allocation strategies • Authorizes significant changes • Resolves conflicts and issues • Provides clear direction to the Project Manager • Review project deliverables and milestones • Identify risks and mitigation strategies
Project Manager	Band Administration	• Manages project in accordance to the project plan • Coordination with Advisory Committee • Supervises consultants and SMEs • Provide overall project direction • Direct/lead team members toward project objectives • Handles problem resolution • Manages the project budget
Project Participants, incl. technical staff and admin support	• Elders • Teachers • Language consultant • Video production team • Others to be identified by SC project Advisory committee	• Communicate project goals, status and progress throughout the project to other participants, and project manager. • Review and approve project deliverables and accountable for milestones • Creates or helps create work products (videos, written materials, curriculum). • Coordinates participation of individuals, teams and stakeholders • Provide knowledge and recommendations • Evaluate outcomes and provide input on key performance indicators • Helps identify and mitigate project risks • Assure quality of products that will meet the project goals and objectives • Achieve milestones on time and on schedule

Other roles and responsibilities are described in relevant sections of this proposal, including Chapter 5 which provides the roles and responsibilities of the governance structure for Biigtigong Nishnaabeg First Nation.

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Infrastructure/Material Resources:

The infrastructure required for this initiative includes the eLearning, eAcquisition, and meetup forum functionalities of the Open edX platform. This online platform will be the primary method of delivering language and STEM training to the target audience. Other technologies/software include Code.org, Tynker.com, Lego.com, CompTIA A+ Exam preparation materials and curriculum, etc. Additional information related to technology resources are included in Chapter 4 of this proposal and will be available to the project team as part of the Project Management Plan.

Capacity Building and Related Initiatives

As part of the Project Management Plan, it is important for the project team to have a solid understanding of existing and ongoing initiatives that may influence the Smart Cities project. The project team has identified three (3) existing projects of particular importance to this project, and that should be monitored as part of the project management process. Project leads from each of the below initiatives are already identified as key stakeholders as part of the Smart Cities process and therefore will continue to be consulted over the course of the project implementation, and beyond, as outlined in our engagement plan presented in Chapter 6.

- **Language Project:** ongoing project to capture and preserve the Nishnaabe language and more specifically the Biigtigong dialect.
- **Curriculum Development:** ongoing project to emphasize cultural and land-based learning activities for K-8 students.
- **New School Project** The community has identified continued education, job readiness and skills training and development as a high priority. Biigtigong Nishnaabeg is currently in the process of designing a new elementary school and Business Training and Education Complex. These facilities can be used to promote this program and facilitate participation by youth and young professional. By having this easy access to the target audience this will ensure that the program is adopted.

Financial Resources

This project will rely on the financial resources provided by the community, other participants and Infrastructure Canada, as presented in Chapter 8.

Strategies for: Risk identification and appropriate mitigation

With any given project there is the potential of risk throughout its lifespan. Risks can be any influence which affects the success of a project (i.e. in terms of budget or schedule). Therefore, risk management is an essential process of identifying, analyzing and responding to these influences that may occur, to ensure the project stays on track. Specifically, risk management involves identifying categorizing, prioritizing and planning for risks, with risks being identified as anything that could potentially impact the success of the project (deadlines, quality, or budget etc.). Throughout this project, risk management will be approached as an iterative and proactive process.

The project team will revisit the Risk Management Strategy throughout the course of the project as needed to identify and monitor the potential risks during each phase of the project. Once a Risk Management Strategy has been finalized, deviation from the agreed upon schedule/budget/scope of work will be identified and promptly communicated amongst the project team so that corrective actions can be taken in a timely manner. It is the intent there will be regular project meetings held to monitor the progress made and to identify any potential risks.

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The initial Risk Assessment has resulted in the identification of initial project risks, and these are presented throughout our proposal. Key Risks and mitigation strategies are summarized in the table below (Additional risks are identified throughout our proposal):

Risk	Likelihood	Impact	Risk Management Approach/Mitigating Actions
Low Student Participation	Medium	Medium	• Program is designed to be interactive and hands on approach • Meaningful outcomes • Onboarding and recruiting strategies • Incentives – i.e. Summer Student Employment • Community celebrations • Good co-op placements • Offer program neighboring First Nation • Develop on-line resources for scalable and replicable
Technology, software and curriculum becomes outdated	Low-High	Medium	• Over time (long-term) the chosen technology and curriculum may become outdated. Responsibility of project team (including SMEs) to continuously identify alternatives. • Designed curriculum based on building blocks, so that the principles of STEM curriculum will not change, • Teachers to continue to revisit teaching lessons and curriculum through existing processes.
Nishnaabemwin audio overdub cost is too high	Medium	High	• Audio-video editing software & related training • Establish work flow procedures and accountabilities • Set up a review & monitoring system • Establish best-practices • Consider use of a first-speaker as a consultant • Research animation and other technological options • Focus priorities and on core competencies
Extreme high cost of uploading and downloading video	High	High	• ISP (PRDC) is providing free on-site services to assist in the offloading, downloading and uploading of video
Expensive video backup system; cloud service unreliable for now	Medium	High	• Develop safe and reasonably costed manual backup system • ISP (PRDC) is setting up a free back up system on their servers
Loss of $100,000 financial contribution from Chief & Council	Low	Medium	• Examine projects and make adjustments (cuts) where necessary • Ensure efficiency and effectiveness of projects • Provide and show value for the $100,000 donation – produce results • Apply for other funding and financial contributions
Change in partners/3rd party involvement or withdrawal.	Low	High	• Build Relationships • Formal agreements • Identify alternative strategies • Continually monitor risk
Admission of new partners.	High	Medium	• Admission mechanisms

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			• Needs based; team approval process • References – due diligence
Conflict of Interest	Low	Medium	• Build strong communication • Maximum transparency • Implement Conflict of Interest Policy
Potential inequalities in partners' resources and expertise determine their relative influence in the partnership's decision making.	Medium	Medium	• Focus on consensus-based decision making • Address in formal agreements • Build relationships • Access to dispute resolution process • Involve experts on Executive Board
Poorly defined shared vision and objectives.	Low	Medium	• Develop shared vision with clearly defined objectives • Link corporate objectives/organizational objectives to the project objectives • Training and Education sessions • Annual and Bi-Annual reviews
performance targets not met in a satisfactory or timely way.	Low	High	• Develop an agreed upon Performance Management framework • Conflict management/resolution procedures • Encourage joint ownership of problems & solutions • Relationship building
Failure to engage key stakeholders in meaningful ways.	Low	Medium	• Awareness & education of engagement strategy • Communication strategy • Performance measurements inclusion • Evaluation strategy
Failure to comply with relevant laws and regulations.	Low	Low- High	• Identification & education of laws & regulations • Dispute resolution process • Develop safeguards throughout project
Partners/3rd party - Lack of understanding of local culture.	Medium	Medium	• Cultural awareness training • Provide explanations – no assumptions • Dispute resolution
Financial risks No strategic approach to issues of risk, costs and benefits	Medium	Medium	• Define and agree with approach to dealing with costs and benefits of the • Continuous monitoring & reporting • Utilize Finance Department & Finance Committee
Loss of autonomy	Low	High	• Rigorous selection of partners • Clear agreements
Lack of capacity, skills, knowledge and experience	Medium	High	• External Recruitment Plan • Local training & development plan • Outsourcing and Contracting Options • Secondments
Insufficient internal & external communication.	Low	Medium	• Establish communication plan & review • Regular meetings • Structured reports • Use of collaboration tools

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The goal of our risk assessment process is to identify, characterize, prioritize and document a mitigation approach relative to those risks which can be identified prior to the start of the project. The Risk Assessment will be continuously monitored and updated throughout the life of the project and will be communicated with appropriate stakeholder as per our engagement plan, presented in Chapter 6.

Since mitigation approaches must be agreed upon by project leadership (based on the assessed impact of the risk, the project's ability to accept the risk, and the feasibility of mitigating the risk), it is necessary to allocate time during each Advisory Team meeting, dedicated to identifying new risks and discussing mitigation strategies.

Procurement, including alignment with technology and partnership requirements

Our procurement strategy will follow our internal policies and procedures which mandate minimum requirements for service delivery, contract terms, First Nation involvement, etc. For this project the majority of procurement requirements have been established through development of this proposal and are the approach is relatively uncomplex in that they are with preestablished service and software providers, products and partners.

Stakeholder identification, including analysis of impact and influence

A stakeholder refers to any individual, organization or group of people with an interest in the project or the ability to affect its outcome. All stakeholders therefore have a vested interest in the successful outcome of a project. From previous engagement experiences on other projects, we understand the importance of including the diverse groups that will be impacted and/or could impact the project. We understand that this journey, especially the reclamation of our language and aadsookaanan, will potentially stir emotions resulting from historical impacts from cultural genocide. We further understand, that it is necessary to walk through these hurts together in order to move forward, heal and reclaim our culture and identity. This proposal required the input of everyone, as it provided another opportunity to build stronger individuals, families, community and a Nation.

In identifying our stakeholders, we considered those who would be immediately impacted and those impacted according to our 7th generation principle (See Chapter 5). Various target groups have been identified and strategies established to facilitate meaningful engagement. As we move forward from development to implementation, we remain committed to developing effective engagement processes that build upon best-practices while creating new and innovative ways of engagement with the project stakeholders. Furthermore, expectation, assumptions and potential risks for each stakeholder will be identified through this engagement. Having an understanding of what is considered the most important outcome for the project amongst the different stakeholders allows project managers to tailor their approach to align with and meet stakeholders needs. Please refer to Chapters 5 and 6 of the proposal for additional details on our stakeholder management process.

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Communication Strategies

Having the support and involvement of all stakeholders will add value to the project, not only through meaningful participation but to also allow for open dialogue and feedback throughout the project. The community engagement strategies completed to date for this project have focused on using our cultural practices to empower youth and community members in a meaningful way.

Throughout the implementation stages of this project a number of these strategies, including community meetings, reporting, surveys, working groups and traditional ceremonies, will be utilized to ensure the continued involvement of the stakeholders at each stage of the project. Most importantly, knowledge sharing and discussions with community members, particularly elders, will be integral to better understanding our traditional Nishnaabe language.

Engagement events (i.e. working groups, community meetings) will be advertised to community members and the general public through the appropriate channels, including but not limited to social media, newsletters and event bulletin boards. A full Engagement Plan for the project can be found in Chapter 6.

Monitoring, controlling, and reporting strategies

Monitor and Control Project Work is the process of tracking, reviewing, and reporting the progress to meet the performance objectives defined in the Project Management Plan. The key benefit of this process is that it allows stakeholders to understand the current state of the project, work completed, budget, schedule, and scope forecasts.

Each member of the project team will be responsible for monitoring the schedule and tasks completed under their supervision. Thus, information sharing and regular communication amongst the project team will be a key component for success.

Should the project team be unable to complete tasks in the allotted timeframe, corrective measures will be implemented immediately, to ensure the project continues without significant delay. Corrective actions may include more frequent project update meetings/conference calls which will allow the project team to collaboratively adjust the internal schedule of the project to ensure all tasks can be completed.

Bi-annual and annual reporting will be conducted and presented to stakeholders throughout the duration of this project, as per the communication and engagement strategy. Bi-Annual reports will coincide with the financial reporting aspect discussed further in Chapter 8.

In terms of reporting to be received from Teachers, reporting to the project team will be completed in the form of summarized and anonymized data, following an agree to template. Reporting to parents and students will follow the exiting process governing their current reporting practices (i.e. report cards).

Approach to sustaining projects beyond the lifecycle of the Challenge

Our project is designed to be implemented over the course of 5 years, with official project initiation beginning September 2019 and implementation ending in August 2024. That being said, significant resources are already in place, and much effort has been expended in developing this

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proposal, which will allow us to hit the ground running. Notably, this project does not have an "end" to its lifecycle, instead the project intends to implement the curriculum which can then continue indefinitely. Of course, there will be the need to continuously review, adjust and enhance the approach and curriculum content, especially in terms of STEM education, but the entire idea of this project is to provide long lasting change to our community which can then be replicated and implemented by any community across Canada or the world.

As previously mentioned, our approach to creating a smart city is an onboarding strategy that would provide long lasting effective change to communities, through empowering youth (and others), through cross-generational transfer of cultural knowledge as well as the much-needed STEM knowledge required to ensure active participation in a smart technology driven economy.

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Chapter 4: Technology

Introduction

Technology in Biigtigong's on-reserve elementary school and on-reserve high school will help revitalize language and culture, will enhance student learning, will provide students with modern bilingual STEM education, will strengthen students' real-world connections to our Biigtigong territory and to other community members, will improve the efficiency and productivity of teaching staff, and will facilitate communication among students, teaching staff, parents, and elders.

The Vision for Technology

Technology is being utilized firstly as a foundation of our entire proposal – the delivery of the Learning Management System – namely Open edX. Open edX, in turn, then serves as the platform atop which our K-8 students will be acquiring their Nishnaabe language – via 2,000 of immersion video instruction, the content of which is our aadsookaanan (our sacred stories, our philosophical foundations, the basic building blocks of our Nishnaabe worldview). Our aadsookaanan will be reconstructed and written, over the five-year period of this proposal - the aadsookaanan reconstruction process assisted, as well, by technology. Additionally, our students in both elementary school and high school will also have STEM education delivered to them on the Open edX platform in a blended-learning environment (i.e., brick-and-mortar instruction augmented with an online component), by augmenting our current K-12 curriculum with the following:

- For our grades K-5 students, the Computer Science Fundamentals curriculum of Code.org.
- For our grade 6 students, a coding course using the Python programming language.
- For our grades 7 and 8 students, two courses in LEGO Robotics utilizing an expanded, projects-based version of the LEGO MINDSTORMS EV3 Curriculum.
- And, for our high school students, the full curriculum of the CompTIA A+ information technology exam preparation.

Additionally, for our high school students, they will receive, through the medium of our Nishnaabe language, STEM course instruction via 1,000 hours of STEM course videos (available in both the Nishnaabe-language and the English-language.) Professional development will be provided throughout the five-year period for all staff to ensure that culture-based technology is used to transform learning and language acquisition opportunities for all students.

Community informationals will be delivered throughout the five-year period for all community members – especially parents of students – to maintain their informed technology-related decision making.

Plan Duration

The duration of the Plan will be five years (September 2019 through August 2024). The Plan will be reviewed and updated bi-annually. The focus of this technology plan is the curriculum augmentations, community informational, and professional development components.

Stakeholders

The stakeholders to this technology plan include the whole community – including students, teachers, administrators, parents, information technology staff, and elected leaders.

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K-12 Curriculum Augmentation

We are building a modern bilingual K-12 STEM curriculum by augmenting our current K-12 curriculum. This chapter will focus on those planned-for K-12 curriculum augmentations.

Technology Plan Vision and K-12 Curriculum Augmentation Rollout by Year

Vision for Technology and K-12 Augmentation

Our vision for technology is the curriculum represented graphically in Chapter 1's Figure 1-1, delivered via the Open edX platform.

Rollout by Year

The yearly rollouts below support the Vision for Technology and K-12 Augmentation. These rollouts begin with an exit goal that states what we expect twelfth grade students graduating from our school to know and be able to do and is followed by yearly rollouts of technology Types 1 and 2 for students and staff who will support learning in our classes and our overall instructional program. These rollouts are intended to guide the implementation of technology across our K-12 curriculum, professional development of teaching staff, educate the community on the relevant technologies, deliver bilingual K-12 STEM knowledge, and support the reconstruction and revitalization of our Nishnaabe language and aadsookaanan (sacred stories).

Exit Goal: Students graduating from Biigtigong's high school (whom have also graduated from Biigtigong's elementary school) will be able to code in an introductory text-based programming language (Python), will be able to assemble and control robots using a text-based programming language (ROBOTC, a language similar in structure to the C programming language), will have successfully completed the exam preparation curriculum for both parts of the CompTIA A+ exam (exam #220-1001, and exam #220-1002), will be able to nearly-completely understand their Nishnaabe language, and will know all of their core aadsookaanan.

Yearly Rollouts of Type 1 Technology:

Year 1 (Sep. 2019 – Aug. 2020)

- We begin using Appsembler, our chosen SaaS-provider of the Open edX platform, to deliver our augmented K-12 curriculum.

Years 2 through 5 (Sep. 2020 – Aug. 2024)

- We continue using Appsembler, our chosen SaaS-provider of the Open edX platform, to deliver our augmented K-12 curriculum.

Yearly Rollouts of Type 2 Technologies:

Type 2: Technologies utilized in our K-12 curriculum

For the rollout schedules of the technologies utilized in our K-12 curriculum, please see Appendix B and Appendix C for each of the five years of this proposal.

Detailed curriculum documents can be found here:

- Code.org – Computer Science Fundamentals curriculum: https://code.org/curriculum/docs/csf/CSF_Curriculum_Guide_2018_smaller.pdf
- Python 1 – Tynker.com's 'Python 101' course curriculum: https://www.tynker.com/school/coding-curriculum/scope-sequence

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- Robotics 1 and 2 curriculum – LEGO MINDSTORMS EV3 curriculum: https://education.lego.com/en-us/downloads/mindstorms-ev3/curriculum
- CompTIA A+ exam preparation curriculum:
    - Exam #220-1001: https://www.certblaster.com/wp-content/uploads/2018/07/A-plus-220-1001-pdf-Exam-Objectives.pdf
    - Exam #220-1002: https://www.certblaster.com/wp-content/uploads/2018/07/A-plus-220-1002-pdf-Exam-Objectives-1.pdf

Type 2: Technologies utilized in the reconstruction and writing of our core aadsookaanan
In the interest of effective use of space here in this proposal, these technologies will be utilized on an as-needed basis to write our aadsookaanan. These technologies will be utilized throughout all five years of the the five-year period.

Type 2: Technologies utilized in the production and provision of our three types of video
In the interest of effective use of space here in this proposal, these technologies will be utilized on an as-needed basis to record, overdub, animate, and edit our video. These technologies will be utilized throughout all five years of the the five-year period.

Yearly Rollouts of Professional Development and Community Education:

Year 1 (Sep. 2019 – Aug. 2020)

- We begin delivering technology-related professional development to K-12 staff.
- We begin delivering technology-related informationals to community members – especially to parents of students.

Years 2 through 5 (Sep. 2020 – Aug. 2024)

- We continue delivering technology-related professional development to K-12 staff.
- We continue delivering technology-related informationals to community members – especially to parents of students.

Details about the Technologies

In addition to our existing technology, there are two main types of technology needed to implement our proposal. The first type comprises the constituent technologies of our Learning Management System (LMS), Open edX. Broadly speaking, Open edX is *the* technology which houses the entire blended-learning experience which we're planning to deliver with our proposal. The second category comprises all other technologies which enable that experience to occur. This second category includes the technologies utilized in our augmented K-12 curriculum; the technologies used in the reconstruction and the writing of our core aadsookaanan; and the technologies employed in the production and provision of our three types of video: Waawaa immersion video, Nishnaabe-language immersion video, and bilingual (Nishnaabe-language and English-language) STEM video.

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Current Technologies

Current Hardware

Apple iPads *(Student Usage)*	60
Apple iPads *(Teacher Usage)*	5
Apple MacBook Pro laptops *(Student Usage)*	34
Apple MacBook Pro laptops *(Teacher Usage)*	10
Windows desktop PCs *(Student Usage)*	22
Windows desktop PCs *(Teacher Usage)*	4
Apple iMac desktop computers *(Teacher Usage)*	1
Promethean ActivBoard Touches	6
Digital SLR Cameras	2
Digital Cameras/Recording Devices	2

Current Software

Video Editing	Windows Movie Maker, iMovie, Adobe Premiere Pro
Photo Editing	Adobe Photoshop
Office Productivity	For Windows: - Word, PowerPoint, Excel, Publisher, OneNote, Outlook For macOS: - Pages, Keynote, Numbers, Notes

Type 1 Required Technologies

Technologies utilized to deliver our Learning Management System (LMS)

- Open edX platform (open source - GNU Affero General Public License)
    - Open edX iOS mobile app (open source - Apache License)
    - Open edX Android mobile app (open source - Apache License)
    - Written in Python (open source - Python Software Foundation License (PSFL) [a BSD-style, permissive free software license which is compatible with the GNU General Public License (GPL)].)
    - Built on Django (open source - Django's BSD license)
    - Utilizes PostgreSQL relational database (open source - PostgreSQL License [a liberal Open Source license, similar to the BSD or MIT licenses])
- Khan Academy API (free proprietary)
- Appsembler (proprietary SaaS-provider of Open edX)
- Customizations by Biigtigong Nishnaabeg to Open edX platform (open source - GNU Affero General Public License)

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Type 2 Required Technologies

Technologies utilized in our K-12 curriculum

- Code.org (open source - Apache License)
- Khan Academy (free proprietary)
- Python - (open source - Python Software Foundation License (PSFL) [a BSD-style, permissive free software license which is compatible with the GNU General Public License (GPL)].)
- LEGO MINDSTORMS EV3 Software (free proprietary)
- LEGO MINDSTORMS EV3 Robot Kit (proprietary)

Technologies utilized in the reconstruction and writing of our core aadsookaanan

- LibreOffice desktop office productivity software (open source - Mozilla Public License Version 2.0)
- ONLYOFFICE desktop office productivity software (open source - AGPLv3)
- MariaDB relational database (open source - GNU GPL v2.0)
- HeidiSQL free and open source administration tool for the MariaDB relational database (open source - GNU GPL v2.0)

Technologies utilized in the production and provision of our three types of video

- Storywriting and screenwriting software (Mariner Persona, Write Brothers Dramatica Pro, Movie Magic Screenwriter)
- Storyboard software (Moviestorm Filmmaker, Power Production's Storyboard Artist Studio, Storymind StoryWeaver)
- Office productivity software (LibreOffice, ONLY OFFICE)
- Digital Pen (Epic Pen)
- Drawing Tablet (Wacom drawing tablet)
- Mocap-capable 2D animation software (Adobe Creative Cloud - Character Animator)
- Webcam (to interface with mocap-enabled 2D-animation software)
- Microphone and accessories (for recording audio with which to overdub the video)
- Riggable 2D-character creation (Adobe Creative Cloud - Illustrator, and Photoshop)
- 3D modelling software (for the creation of assets for the animatics in the 2D-space 'digital flip chart' immersion instruction by the 2D-animated character) (Sketchup Pro)
- Screen recording software (TechSmith Camtasia)
- Video-editing software (Adobe Creative Cloud - Premiere Pro)
- Audio-editing software (Adobe Creative Cloud - Audition)
- SFTP (Secure File Transfer Protocol) client (WinSCP)
- SSH (Secure Shell) and Telnet client (PuTTY)
- Video player software (VLC Player)

Relevant Applications Elsewhere

These technologies are applicable and useful in governance (especially for effectively engaging community member in all facets of community life), new council member initiation, training of new staff, ongoing professional development of current staff, general community informationals, and bringing the entire organization online.

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Results of Testing and/or Piloting in the Finalist Phase

We achieved fun and excellent results throughout the finalist phase in all of our pilot projects. Our biggest challenge, as we mentioned in Toronto at our November Jury Check-In, was easing the fears of the teachers and inspiring them with hope for new possibilities concerning their lack of technical expertise in the areas of Technology and Engineering. Coding, in particular, seems to have unnerved the staff of our elementary school the most. Our Elementary School's professional development sessions with the teaching staff, their testing and piloting of the technologies in the classroom and the community, including actual blended-learning classroom sessions using Khan Academy and Code.org, building and controlling Lego robots, and employing block-based programming to control circuit boards using Scratch and Makey Makey, transformed these moments of doubt into empowering moments of possibilities (in our teaching staff's own words!).

Approach to Future-Proofing the Technologies

Firstly, most all of our software applications which are not open source have 'safety-net' open source equivalents. This is how we're safeguarding against vendor-generated proprietary constraints and obsolescence while simultaneously enabling transferability and scalability. Our few proprietary choices here allow us to go faster and thus be more efficient and effective with our time due to the fact that we have personnel with considerable experience in the proprietary versions of these software applications. Should, however, any of the vendors of these proprietary software applications which we're using do something which disallows us to continue effectively using their software, we can quickly and near-frictionlessly switch over to the respective open source equivalent software application with little to no interruption in our workflow.

Secondly, while we are certainly onboarding youth into the smart cities future. We're *also* onboarding K-12 teachers and staff, as well as community members in general. The continuing professional development of teaching staff, and the ongoing informing of the community will produce for us a workforce that is able to implement and operate the technologies and systems going forward into the smart future.

Adoption of Architectures, Guidelines, and Initiatives

Had we chosen to install Open edX's software on servers other than Appsembler's, we would have indeed had an an architecture adoption challenge to contend with. Because we are attempting to make this proposal's approach to moving into the smart future as newbie-friendly as possible, we have chosen to simply use Appsembler as our SaaS (Software as a Service) provider of the Open edX platform. The architecture issue thus goes away as we have only a web-based interface to Appsembler to contend with. A very newbie-friendly approach, indeed.

The guidelines that concern us here are the blended-learning guidelines. We are not advocating for an 'online' school. What we are advocating is enhancing brick-and-mortar curriculum delivery with some online options. The guidelines for attaining this hybrid approach is what we are referring to when we use the term 'blended-learning.'

Similarly, the initiative which concerns us here is the Growth Mindset as implemented by Khan Academy. The Growth Mindset can be many things to people. Fir us, we once again, take a newbie-friendly approach. The Growth Mindset in its minimalist form is not allowing students to progress in their curriculum studies without first mastering the content in their current stage of learning. For example, a student receiving an 85% in a math quiz, for example, is made to redo the quiz until that student receives a perfect score. This is a fundamental approach of Khan Academy, and one which we wish to emulate

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on our online quizzes using randomized tests with a large database of possible questions for our students. These randomized tests are what we are referring to in our Type 1 Required Technologies section by Customizations by Biigtigong Nishnaabeg to Open edX platform. These are simple JavaScript scripts placed on the front-end webpages of our students quiz pages on Open edX that create a Khan Academy-like testing experience, rendering it what we are referring to as a Growth Mindset Approach to learning.

Interoperability

- Open edX with Appsembler's API (Application Programming Interface) make the platform interoperable with any other technology one could reasonably choose to interface with.
- Using Khan Academy's API (Application Programming Interface) for Khan Academy courses which we'll be offering inside of Open edX makes this customized aspect of Open edX interoperable with nearly any other technology.
- Existing community systems and services are currently not networked. Open edX will be the platform with which Biigtigong Nishnaabeg begins to connect these community systems and services.

Replicability and Scalability

Because we have chosen a foundational platform which is fully open source (Open edX), which we're augmenting with curriculum components (e.g., code.org) and learning-facilitation aids (e.g., Khan Academy) which, too, are nearly all open source and free of charge, our proposal - nearly in its entirety - is replicable in any community one might wish to bring it to.

As we've stated earlier, in the cases where we have chosen to use a proprietary technology – for example, LEGO, which does not operate in the open source ecosystem – we have been careful to make sure that there are near-equivalent open source options - in this case, Raspberry Pi, which does operate in the open source ecosystem – for that technology.

Additionally, as we state several times throughout our proposal, we are offering an onboarding approach to communities that may not have access to bleeding-edge technology, nor perhaps to bleeding-edge technology's administering engineers, programmers, or operators. It is our hope that by keeping the technology requirements of our proposal to a minimum, making our approach as replicable and scalable as is reasonably possible, and still delivering a smart technology approach, we can thereby help facilitate the spread, and long-term acceptance and flourishing of, smart cities throughout Canada.

Roles and Responsibilities of Technology Partners

Technology partners:

- Software and hardware partners
    - Roles and responsibilities are clearly delineated and articulated in the software licensing agreements of each of the technologies.
- Pic River Development Corporation (PRDC) - *Internet Service Provider (ISP)*
    - Most importantly, PRDC's role is to provide for our Waawaa immersion video producers a place in which to offload their video each week. Without this important role being played by this ISP partner, our video producers are forced to use Dropbox or something similar to upload their video instead of being able to simply offload it. This is not an ideal option as piloted upload times during the finalist phase had been exorbitantly and prohibitively high. Offloading all of their video each week onto the servers at PRDC's office is an extremely time-efficient way to get their video to our Nishnaabe-language overdubber.

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Technology Accessibility and Usability for Uptake and Acceptance

Community informationals, especially for students and parents of students, will facilitate the community's uptake of Type 1 and Type 2 technologies.

Identification of Risks

Technology – Risks and Mitigation Strategies			
Risk	Likelihood	Impact	Mitigation Strategy
Limitations as a result of internet connections.	Medium	High	• Selective over software – set standards & assessment • Minimize use of cloud computing
Video uploading and downloading time is lengthy and irregular.	High	High	• Agreement with the ISP (PRDC) • PRDC to provider server space for video storage • PRDC will upload video to their servers
Lose control over data	Medium	High	• Establish local control policy & provider/partnership assessment process • Thorough planning over data collection & data management • Formal agreements for control • Establish monitoring system
Resistance from all levels – students, parents, staff	Medium	Medium	• Conduct education sessions • Professional development • Good communication systems • Regular reporting • Set up support systems • Provide performance summaries
Risks related to the increased access to sensitive information	Medium	High	• Secure computers, servers and wireless networks • Use anti-virus and anti-spyware protection, and firewalls • Regularly update software to the latest versions • Use data backups that include off-site or remote storage • Secure your passwords • Train staff in IT policies and procedures
Cyber-threats including malware	Low	High	• Security software, user training, and policies and procedures in order to safeguard our systems, networks, and information.
Commercial software providers are now integrating their products with social media sites, making risk mitigation very difficult.	Medium	Medium	• Try to avoid providers who integrate their products with social media. • Formal agreements to address issue
Failed Internal Processes – the failure of internal processes to perform as needed or expected. This comes from poor process design or execution, or faulty process controls.	Low	Medium	• Technology development team to develop processes • Stringent review process and reporting • Communication of internal processes • Education
Lack of technical competence	High	Medium	• Recruiting plans

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			• Internal building of capacity – short and long term • Use of experts • Outsourcing
Financial Costs too high	Medium	Medium	• Good planning and cost estimates • Budget reviews • Alternative revenue sources • Internal program reviews – looking for efficiencies

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Chapter 5: Governance

Introduction

Biigtigong Nishnaabeg have always governed ourselves in accordance with our traditional laws, customs, language, traditions, values, processes and structures. Over the years these have changed, mostly as a direct result of the impacts of colonization, where systems in direct contradiction of our cultural ways were imposed upon us. In response to centuries of culture and language loss and disconnection from our social and philosophical systems, we are committed to rebuild our contemporary governance systems that reflect our Nishnaabe culture.

Culture lies at the heart of governance. It forms the foundation and fosters the collectivism of a people through a shared sense of values, beliefs, meaning, knowledge systems, rules, purpose and vision. Through this shared culture, acquired over generations of our people, we are connected beyond the confines of our organization and the projects we create and implement. Our organization and project governance systems are an extension of and reflection of our Nishnaabe way of existing as individuals and as a collective.

The governance plan set out herein seeks to align cultural our Nishnaabe cultural practices and beliefs with modern practices, to facilitate a process that supports the implementation of the project and increases the success of achieving our outcomes. The governance structure has been established under the authority of Chief and Council. The structure was carefully designed to ensure it effectively facilitates the successful implementation of the proposal and the attained of the respective outcomes. It is based on Biigtigong's best practices and in alignment of its long-term vision in respect to governance.

According to the Project Management Institute (PMI), project governance is the elements and strategies that make a project successful. It is based upon the tailored needs of the community. The governance framework and strategies for this project are tailored to the community, rigorous, transparent, and will deliver value for money. The project team will ensure that the governance framework is implemented throughout the project and adjusted if deemed necessary.

Our Governance Structure

Biigtigong Community:

We are ultimately responsible to the members and residents of Biigtigong Nishnaabeg, including our ancestors and the seven generations to come. The people are the foundation of our governance structures. We are building upon a strong sense of community and a commitment to the vision for our children. Our governance structures and engagement strategies facilitates and builds strong connections with our community. Our Smart Cities Governance Plan makes community involvement and engagement a priority. We will create new opportunities for their involvement and build upon the existing systems. We ensure structures are in place to include our community throughout the lifecycles of projects and our long-term strategies. We are accountable to our members and their involvement is critical to ensuring we achieve our outcomes.

Chief and Council:

As the formal elected leadership of Biigtigong, this governing body is ultimately responsible for the overall affairs of the First Nation. Council has established governance systems that provide the necessary support and parameters for effective project governance systems. Our political and administrative functions are clearly defined and separated. Elected leadership is responsible for strategy and providing

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the systems, laws, policies, and other resources, to support successful implementation of projects. The governance model adopted for the Smart Cities project follows, aligns and enhances Biigtigong's Governance systems.

The Chief and Council through the authority of Biigtigong's Constitution will establish an Executive Board to oversee the Smart Cities Proposal. Additionally, two committees will be set up to support the proposal and the attainment of the outcomes. Both committees will play an integral role in achieving our outcomes and in creating high levels of accountability and involvement of our community. The following provides a brief overview of these three entities.

SC Executive Board

This board has been mandated as the governing body to oversee the implementation of our Smart Cities proposal. They will provide strategic direction to ensure the proposal continuously meets the needs of the community and achieves the identified outcomes. The Board will deliberate, make decisions, advise, provide strategic oversight, and to serve as the primary "advocate" for all the Smart Cities initiatives.

The Board is also responsible for the key business issues associated with the project. This includes approving the budgetary strategy, monitoring risks, quality and timelines, making policy, defining outcomes and deliverables, assessing change requests.

The Board will oversee the activities of the Aadsookaanan Reconstruction Committee and the Clan Engagement Committee. Both Committees were established to mitigate potential risks and create new opportunities. The Board will supervise and work the Smart Cities Project Lead throughout the project.

The Board reports directly to the Chief and Council and is subject to the regulations set out in the Terms of Reference for the Board and the Regulations Governing Committees. The Board and Council will collectively innovate on improving the reporting systems, promoting transparency, accountability and stakeholder engagement.

Due to the strategic importance of the proposal to the future of the community, the Chief will sit as the representative of the elected leadership. The Board will also be comprised of our CEO, Education Director and two youth. To increase success and mitigate risks, our Board will also include experts from the following fields: Nishnaabemwin (Language), Science, Technology, Engineering and Mathematics. We have five experts who have committed to sit on this Board.

Aadsookaanan Reconstruction Committee

This Committee will be part of the governance arm and will report directly to the SC Executive Board. Comprised of elders, traditional knowledge holders, and language carriers, youth and parents, this team will be responsible to assist in the reconstruction of our sacred stories, our Aadsookaanan.

Their primary role will be to provide guidance and direction to the technical and research group. They will have decision-making authority to approve the core aadsookaanan and forward the stories to the Immersion Team for video production. The Committee will also assist in mitigating risks that exist or may come to be. The primary risk management strategy includes engaging with the community and providing information and education.

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The Committee will operate according to its Terms of Reference and Biigtigong's Regulations Governing Committees. Following our cultural protocols governing elders and the transfer of knowledge is foundational to our governance plan.

Clan Engagement Committee

Engagement with all of our stakeholders is a critical factor to achieving our outcomes. In order to achieve high levels of meaningful engagement, we will employ our traditional clan system for this purpose. Each clan will select 2 representatives to sit on the Clan Engagement Committee. Clan leaders are responsible to report directly back to their respective clans, following the protocols established by the clans. Clan leaders hold the responsibility for two-way communication and reporting. This system allows for diverse engagement and facilitates deeper discussions and collaboration.

Inside the structure of the clan system are protocols that speak to the roles and responsibilities of individuals and the clans. Accountability, disclosure and transparency are inherent to the system. It also addresses ethics, communication, and codes of behavior, decision-making methods and dispute resolution. From an organizational perspective, the Clan Engagement Committee will report directly to and work closely with the SC Executive Board. The team will operate according its Terms of Reference and Biigtigong's Regulations Governing Committees.

Linkages with Existing Committees:

We will utilize existing governance structures to support the implementation of our proposal.

Youth Council

Our governance model will facilitate linkages between the SC Executive Board and our Youth Council, via the Board's two youth representatives. The Youth Council is an existing Committee that represents the interests of the youth and facilitates their involvement in the growth and development of their community. We will utilize this relationship to improve our connections with our youth and ensure we are meeting their needs.

Education Committee

The Education Committee is mandated as an advisory function in support of the Education Department. It is a primary means for parental involvement in education. We will utilize these resources, via the Education Director, to support the proposal's implementation, specifically within the Education Department. This provides another link to the stakeholders and ensures alignment with the Education strategy.

Finance and Audit Committee

The Finance and Audit Committee is responsible to review and make recommendations to Council on the financial administration matters of the Nation. The Finance and Audit Committee assists Council in fulfilling its oversight responsibilities for the financial reporting process, the system of Internal Control, the audit process, and the process for monitoring compliance with laws and regulations and the code of conduct.

The Executive Board will comply with the initiatives of the Finance and Audit Committee and the Director of Finance to ensure financial accountability and transparency. Biigtigong's Financial and Administrative Policies and Procedures govern the financial and human resource management of the project.

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Project Implementation Governance Systems

Some of the Smart Cities projects fall under the mandate of existing Departments. These projects shall become the responsibility of various Departments, such as, Education and will be administered in accordance with the existing governance and management systems of the First Nation. There are institutionalized and established systems that define roles and responsibilities, personnel matters, finance, performance management and evaluation, dispute resolution, risk management, reporting responsibilities, lines of authority and lines of command.

Senior Management Team

Inside of this system is an established Senior Management Team comprised of all Department and Service Directors. This body acts as the central coordinating entity for the First Nation that facilitates a holistic approach. A member of this team will be appointed to the SC Executive Board to ensure continuity, alignment and accountability. This individual will also act as a liaison between the Senior Management Team and the Smart Cities Executive Board. Respective Directors will obtain direction and provide input via this process and take the necessary steps for implementation within their departments.

Education Department

Our Education Department will be responsible for the implementation of the core components of our proposal, including the K-12 STEM program, Nishnaabemwin Immersion and the Meet-Up App. An organization review was conducted to determine the requirements for the integration of the new programs. Governance systems that define staffing requirements, organizational and reporting structures, roles and responsibilities, performance management, training and development, risk mitigation strategies, and financial requirements for the Smart Cities implementation are established. The education staff was involved throughout the entire review and development phase.

The implementation of the education components of the proposal will be under the direction and supervision of the Education Director. The Director will report on the activities and status of the projects to the Executive Board and the Project Lead. The reporting structure is designed to be flexible to allow for adaptive approaches to respond to changing needs. The Education Director will also provide updates and facilitate necessary action and support with the Senior Management Team.

Economic Development Department

This Department will be responsible for the implementation and management of our Youth-owned Student IT Business, the co-op placements and summer employment. Our team will work collectively with this department to create an innovative pathway for our high school students, providing an academic foundation supported by real-world work experiences. Our economic development department will build relationships with STEM based industries to assist in the co-op placements and summer employment. Our co-op program will be governed by the Ontario Ministry of Education standards and our own internal policies. Special considerations for individuals enrolled in the CompTIA A+ program will be built into our Summer Student Employment Policy, to support their path throughout high school.

Smart Cities Inter-departmental Program Committee

As part of our governance structure we will create an inter-departmental program committee, comprised of front line staff that are directly responsible to deliver specific programs. This team will consist of the SC Project Coordinator, Immersion Lead, STEM Lead, Co-op Lead, Meet-up App Lead and the Economic Development Manager. This group will work to strengthen collaboration across the team and integration of projects. They will review activity reports, monitor progress and outcomes, discuss administrative concerns, identify training needs, coordinate project management, identify risks and

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solutions and create substantial working relationships. The Committee will report to the Education Director. The Education Direction will bring all appropriate matters to the attention of the Senior Management Team and/or Executive Board.

Governance Principles

We will utilize our traditional governance principles, as set out in our Aadsookaanan, as embedded in our language and ceremonies, as practiced within our operations and commit to gaining a greater understanding of our traditional ways and establishing more effective and legitimate governance systems. Our principles support processes that are consensus oriented, participatory and inclusive, transparent, accountable, long-term considerations, responsive to change, flat and non-hierarchical, and based on relationships. We will adhere to the governance principles identified in Biigtigong's Constitution, laws, policies, procedures, informal protocols and cultural practices.

Decision-making

Our cultural practices utilize a consensus-based decision-making model. As an approach to fostering collaboration, consensus-based decision-making provides every individual equal access and responsibility to the process. This model facilitates improved decisions due to the stakeholders claiming responsibility by providing input in keeping with the best interests of the seven generations to come. It fosters increased interpersonal connections and relationships, resulting in greater sense of cohesion and commitment to the goals and vision. Utilizing our cultural practices and embedding our values inside of our governance system enhances the project and its successful implementation.

Part of our decision-making model includes mechanisms to deal with conflicts and disputes. We utilize a restorative justice model as our dispute resolution process. Based on cultural values our systems aim to restore harmony, balance and build relationships. We will utilize Biigtigong's processes to address potential conflicts with or amongst our stakeholders.

Human Resource Management

Human Resource management is coordinated by Biigtigong's Finance and Administration Department. Policies and procedures are in place to govern hiring and recruiting, training and development, travel, honoraria, salary, compensation, performance appraisals, employee benefits, health and safety, contracts, confidentiality, code of ethics, conflict of interest, dispute resolution, employee relations and well-being. This centralized system promotes fairness, consistency, transparency and accountability. All staffing and awarding of contracts associated with the Smart Cities proposal will be subject to the existing policies of the First Nation.

Change Management

Our culture acknowledges the world is in constant flux and change; we are in a perpetual state of responding to this change. The concepts of renewal and transformation are inherent to how we interact with the inter-connected world. These beliefs are reflected in our governance systems. We adopt a learning environment that fosters change and utilize iterative management practices to ensure on-going alignment between our outcomes and the needs of our stakeholders. We offer employee assistance programs to assist in change management. Additionally, our Social Services Team provides supports to assist individuals, families and teams, with any issues that arise as a result of change. We also rely on our cultural ceremonial practices to assist in our change management efforts.

Risk Management

Our goal is to create an organization culture where risk identification and management become part of everyday life. Although it is important to conduct a risk assessment at the onset of a project, it is equally

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important to ensure risk management activities are performed, recorded and monitored throughout the lifecycle of the project. Our risk management strategies aim to accomplish this.

For this project, we will utilize a framework that provides for a process for risk identification, risk analysis, risk response planning, monitoring, controlling and reporting. For each major risk that is to be mitigated or that is accepted, a course of action will be outlined for the event that the risk does materialize in order to minimize its impact. Monitoring and reporting mechanisms will be built into all levels of governance and project implementation. Ultimately, the risk management plan is the responsibility of the Executive Board.

Communication Plan

Communication is the key to a successful project. Our communication plan identifies key stakeholder and avenue for the delivery of pertinent information. Information will be delivered to all stakeholders in a timely fashion. Our engagement plan provides more details on how we plan to build strong communication with our stakeholders.

Control Process

The project team will continuously monitor the project against established timeline and metrics. This will ensure that the project is in accordance will budget and timeline and that deviations are remedied. Our internal systems of control are well defined and tested. We have made some adjustments to ensure our Smart Cities implementation is done so successfully.

Partnerships

Introduction

The goals of our Smart Cities proposal are ambitious and require a collaborative approach to make them achievable. Partnership opportunities exist across many sectors and include individuals, businesses, education institutions, governments and community organizations. Partnerships are a strategic process and our approach to partnerships begins at home by creating a solid foundation that we can build upon. We want Smart Cities to live beyond the life of the proposal and become part of how Biigtigong exists.

Our Internal Partnerships

The impacts of our proposal outcomes will create substantial change that extends past the individual students and into the social and economic fabric of the community. Preparing our children for the digital world also includes preparing our organizations and community. This is why our membership is best served by aligning our different departments and related organizations. These alliances require deep interpersonal connections and appropriate structures and systems in order to yield the highest benefits.

Our internal partnerships are living systems that evolve progressively in response to the changing environment and the needs of our membership. Building upon and utilizing our internal resources and developing our capacity are necessary to achieve long-term sustainability. Collaboration between our service departments and community owned organizations are critical to achieving success.

Our focus, the central point of everything, is our children and this is what brings us together and keeps us together. The elders always remind us that it is our responsibility to keep our children in the center of everything. Sharing a common vision and purpose is what binds successful partnerships. Our Smart Cities proposal is attached to and supports Biigtigong's bigger vision of Nation building.

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Biigtigong's Service Departments

Our Smart Cities proposal development team, which consisted of two members of the Senior Management Team and the Chief, approached the proposal implementation phase as a collective effort of our entire team. The goals of the proposal align with the overall goals of the organization, making it easy to establish collaboration and project partnerships. We entered into collaboration agreements with our service departments. The purpose of these agreements is to demonstrate that the proposal is supported by the entire organization.

Our internal partnerships are governed by the structures, regulations, practices and historical relationships that exist within the organization. We have established and proven frameworks that we utilize for our projects. These frameworks address general project management requirements, such as, managing risks, finances and resources, quality assurance and performance management, human resource and capacity development, reporting and accountability and team development. Our implementation plan is build upon our assessment of our internal capacities, readiness and resources.

To ensure success, our implementation plan allocates specific tasks to respective departments who have a related mandate. For example, our Sustainable Development Department who is responsible for economic development, employment and training, will be responsible for the establishment of the high school reBOOT IT business, co-op placements and summer employment. While our education department will be responsible for the academic portions of the co-op high school program. Such partnerships allow us to extend the reach of our project goals and build the foundations for long-term sustainability.

The community retains control over sensitive and personal data. We already have established policies and systems that manage and control data collection. We do not want to re-invent systems but rather utilize existing resources and help make necessary improvements where we can.

The initial commitments from our service departments are identified in the collaboration agreements attached. These will be continuously reviewed, monitored and developed to ensure the best possible strategies are collectively in implemented to better serve our membership. Our Smart Cities proposal has provided another rallying point to collectively strategize in bringing together our efforts to innovate and make meaningful lasting change and improvements.

Our External Partnerships

Two of our main external partnerships are with independent, but related entities of Biigtigong. Pic River Development Corporation is the Internet Service Provider in the community and will provide services for the off-ramping, uploading, downloading and backup storage of our videos at no cost. They also made a financial commitment to support the project implementation. Anishinabek Employment and Training Services is an entity that provides employment support and training services on behalf of 9 First Nations. A three-year financial contribution has been made to assist in the development of the CompTIA A+ and reBOOT co-op education program and the summer student employment portion. Biigtigong has existing agreements with both entities that defines the relationship, mandate, governance structures and other areas. The risks associated with these partnerships are extremely low and mitigation strategies to address the risks are already in place.

Biigtigong has many business partners and professional relationships. Part of our business strategy is to develop mutually beneficial partnerships that create value. We seek to be a 'partner of choice' and have a history of successful partnerships. Letters of support from some of our business partners are attached to this proposal. We have not entered into any formal partnership agreements but we will explore the

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options when needed. At which time we will enter into formal agreements that define the details of the partnership.

Our Service Partnerships

Our Smart Cities team has enlisted the help of two organizations who bring value to achieving our set outcomes. Memorandums of Understanding have been signed with ICTC and reBOOT Canada and provide the details of the partnership. Both entities are assisting us with the implementation of our K-12 STEM programs. Our projects share common visions and provide services that complement each other and provide a good fit. We have developed excellent working relationships and have created a common path and are equally excited to embark on our journey together.

Anishinabek Education System

23 First Nations are part of an education self-government agreement with Canada and Ontario, forming the Anishinabek Education System. The participating First Nations under the Anishinabek Education System will enact education laws that govern the Anishinabek Education System and the delivery of programs and services. Each participating First Nation has law-making power and authority over education from JK to Grade 12 on reserve. Participating First Nations will also establish and maintain system-wide education standards that support the transfer of Anishinabek students between the Anishinabek Education System schools and the provincial education system schools.

AES is in its development stage and in the process of getting established and operational. The Board has provided a letter of support of our proposal and we will explore options on how our proposal implementation can assist the other 22 First Nations. AES is an opportunity for First Nations to collectively work together to address the education needs of our children. We expect that as AES develops that we will create innovative approaches to improving the lives of our children.

Summary of Partnership Agreements

Source	Type	Notes
Internal Collaborative Partnerships		
Children & Family Learning Centre	Collaborative Service Agreement	Biigtigong Service Department
Health & Social Services	Collaborative Service Agreement	Biigtigong Service Department
Sustainable Development	Collaborative Service Agreement	Biigtigong Service Department
Capital-Housing	Collaborative Service Agreement	Biigtigong Service Department
Finance & Administration	Collaborative Service Agreement	Biigtigong Service Department
Education	Collaborative Service Agreement	Biigtigong Service Department
Service Partnership Agreements		
Pic River Development Corporation	Memorandum of Understanding	Biigtigong Non-Profit Corporation
reBOOT Canada	Memorandum of Understanding	New Partner
Information And Communications Technology Council (ICTC)	Letter of Support Memorandum of Understanding (waiting on approval)	New Partner
Anishinabek Employment and Training Services (serves 9 First Nations)	Letter of Support – financial commitment	Aboriginal Skills Employment and Training Strategy
Industry Support		
S. Burnett & Associates	Letter of Support	Business Relationship/Partner
Anishinabek Education Services (23 First Nations)	Letter of support	Anishinabek Nation Education self-government agreement
Nishnawbe-Aski Development Fund (NADF)	Letter of Support	Business Relationship/Partner
AV Terrace Bay Woodlands	Letter of Support	Business Relationship/Partner
Barrick Hemlo	Letter of Support	Business Relationship/Partner
BDO	Letter of Support	Business Relationship/Partner

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CRC Communications	Letter of Support	Business Relationship/Partner
First General Services	Letter of Support	Business Relationship/Partner
Supercom Industries	Letter of Support	Business Relationship/Partner
Chant	Letter of Support	Business Relationship/Partner
Biigtigong Dbenjgan	Letter of Support	Business Relationship/Partner
BMC Contracting	Letter of Support	Business Relationship/Partner
BMO Bank of Montreal	Letter of Support	Business Relationship/Partner
DJB Consulting	Letter of Support	Business Relationship/Partner
FP Innovations	Letter of Support	Business Relationship/Partner
GMS Camps & Catering	Letter of Support	Business Relationship/Partner
Hydro One Networks Inc.	Letter of Support	Business Relationship/Partner
Mkwa Timber GP	Letter of Support	Business Relationship/Partner
Ontario Waterpower Association	Letter of Support	Business Relationship/Partner
Royal Bank of Canada	Letter of Support	Business Relationship/Partner
TBT Engineering	Letter of Support	Business Relationship/Partner
** Evidence and details of partnerships are included in the Appendices.		

Governance & Partnership Risks and Mitigation Strategies

Risk	Likelihood	Impact	Risk Management Approach/Mitigating Actions
Change in partners' involvement or withdrawal.	Low	High	• Build Relationships • Formal agreements • Identify alternative strategies • Continually monitor risk
Admission of new partners.	High	Medium	• Admission mechanisms • Needs based; team approval process • References – due diligence
Conflict of Interest	Low	Medium	• Build strong communication among the partners • Maximum transparency • Implement Conflict of Interest Policy
Potential inequalities in partners' resources and expertise determine their relative influence in the partnership's decision making.	Medium	Medium	• Focus on consensus based decision making • Address in formal agreements • Build relationships • Access to dispute resolution process • Involve experts on Executive Board
Poorly defined shared vision and objectives.	Low	Medium	• Develop shared vision with clearly defined objectives • Link corporate objectives/organizational objectives to the project objectives • Training and Education sessions • Annual reviews
Partners do not meet performance targets in a satisfactory or timely way.	Low	High	• Develop an agreed upon Performance Management framework • Conflict management/resolution procedures • Encourage joint ownership of problems & solutions • Relationship building
Failure to engage key stakeholders in meaningful ways.	Low	Medium	• Awareness & education of engagement strategy • Communication strategy • Performance measurements inclusion • Evaluation strategy

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Failure of partner to comply with relevant laws and regulations.	Low	Low	• Identification & education of laws & regulations • Dispute resolution process • Develop safeguards throughout project
Lack of understanding with local culture.	Medium	Medium	• Cultural awareness training • Provide explanations – no assumptions • Dispute resolution
Financial risks No strategic approach to issues of risk, costs and benefits	Medium	Medium	• Define and agree with approach to dealing with costs and benefits of the partnership. • Continuous monitoring & reporting • Utilize Finance Department & Finance Committee
Loss of autonomy	Low	High	• Rigorous selection of partners • Clear agreements
Lack of capacity, skills, knowledge and experience	Medium	High	• External Recruitment Plan • Local training & development plan • Outsourcing and Contracting Options
Poor internal & external communication.	Low	Medium	• Establish communication plan & review • Regular meetings • Structured reports • Use of collaboration tools

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Chapter 6: Community Engagement Plan

Part 1: Our Approach to Engagement

Our engagement plan is built upon our fundamental belief as Nishnaabeg that everything is inter-related and inter-connected. We view the world as being in constant motion, made up of complex networks and long-term sustaining relationships. We understand the importance of developing and maintaining relationships and the goal of keeping balance and harmony. As a relationship based system, the principle of inclusion is foundational to how we live our lives. Hence, our approach to engagement is inherently inclusive in nature and facilitates high degrees of community participation in meaningful ways.

Our engagement plan, not only facilitates the involvement of our stakeholders, but it does so in a manner that supports the revitalization of our traditional ways in a modern world. Our engagement plan facilitates the coming together for a common vision and purpose. It supports the continuous development as individuals and as a community, as it affirms our common values, builds trust, strengthens relationships, fosters responsibility and accountability and facilitates community ownership.

Purpose of Engagement:

The overall purpose of engagement is to create opportunities for our children, youth, parents, grandparents, aunts, uncles and all Biigtigong members, to embrace their responsibility for the well being of our community and future generations and become actively involved in creating a better world.

Engagement Objectives:

1. To empower those affected by this proposal to be involved in the decision-making process and the creation of solutions to challenges and opportunities that are specific to stakeholder needs.
2. To ensure the engagement processes are meaningful and seek out real contributions that influence the project design and implementation.
3. To facilitate a learning environment, where the transfer of knowledge and skills encompasses everyone who is impacted by the project.
4. To utilize cultural practices to ensure successful engagement and facilitate community pride.
5. To document and share our experiences with engagement, in order to assist in making this project more scalable and replicable.

Engagement Principles:

The following guiding principles form the basis of our engagement process and approach to ensure high-quality collaboration and meaningful active participation.

1. **7th Generation Principle:** We are responsible for the seven generations to come and to the seven generations that came before us. We will move forward embracing our past and future generations and remember the long-term impacts of our decisions.
2. **All my Relations**: Our way of life is centered on the belief that we are all related and connected. Every decision impacts everything. We will seek out holistic approaches that honour all life and our complex networks.
3. **Relationships:** Developing and maintaining relationships with all life is central to our Nishnaabe way of being, bringing rights, obligations and responsibilities that extend beyond self. We act accordingly, always striving for a state balance and harmony, as we work collectively towards our vision
4. **Renewal and Transformation:** The notions of renewal and embracing change are inherent in our worldview, as we view the world as in a state of constant flux and change. We will utilize

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approaches that respond to continuous change and implement on-going evaluation to ensure we are meeting our goals and the needs of the community.

5. **Process Focused:** Comprised of approximately 70% verbs, the importance of process and actions are embedded in our language. Our approaches will be action-orientated, focusing not only on achieving results, but also on the journey and lessons that our journeys bring.
6. **Natural Laws:** We learn about what our behaviour should be by observing Mother Earth and respecting the natural laws.

Stakeholder Identification

This proposal will change the essence of the social fabric of the community. From previous engagement experiences on other projects, we understand the importance of including the diverse groups that will be impacted and/or could impact the project. We understand that this journey, especially the reclamation of our language and aadsookaanan, will potentially stir emotions resulting from historical impacts from cultural genocide. We further understand, that it is necessary to walk through these hurts together in order to move forward, heal and reclaim our culture and identity. This proposal required the input of everyone, as it provided another opportunity to build stronger individuals, families, community and a Nation.

In identifying our stakeholders, we considered those who would be immediately impacted and those impacted according to our 7th generation principle. Various target groups were identified and strategies established to facilitate meaningful engagement. Evaluations of these approaches were conducted and necessary changes were implemented and/or noted to improve outcomes. As we move forward from development to implementation, we remain committed to developing effective engagement processes that build upon best-practices while creating new and innovative ways of engagement.

Part II: Our Engagement To Date

Efforts to ensure participation amongst the diverse groups within the community have provided valuable insights that have significantly improved the final proposal. Our engagement processes to date have resulted in obtaining a clearer understanding of the challenges and opportunities that exist or could potentially exist throughout the life of the proposal implementation stage and beyond. It facilitated the development of creative mitigation risk strategies and creative means to grab the opportunities. Our engagement process has led to an excitement; it has provided a central rallying point. The following provides a list of primary stakeholders engaged to date, the methods used for engagement and the insights gained from the engagement that shaped our proposal.

Formal Leadership

Engagement with our elected leadership has reiterated their long-term commitment to the goals and the expected outcomes of this proposal. Council echoed the need to build everything in a manner that will lead to long-term sustainability. In order to ensure long-term success, the spirit of the proposal must become part of the DNA of the entire organization and community. Due to the nature and outcomes of the proposal, the entire organization and community, must strategically align resources in the collective pursuit of our vision.

Council understood the need to build STEM knowledge in order for the community to participate in the rapidly changing world. Additionally, that the creation of children who understand their traditional language, for the first time in centuries, will profoundly change the fabric of the community and our institutions. Council also restated their excitement that our proposal will impact people beyond our

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community. Direction was provided to our Senior Management Team to ensure our strategies align and support the specific goals and outcomes of the Smart Cities proposal.

Our Senior Management Team is constantly creating, evaluating and reimaging our vision, our strategies, successes and failures, in our efforts to build our Nation. Working towards a common vision, our education, health, social services, lands and resources, governance, economic development, housing, and public works team, collectively and strategically aim to address the needs of our community. Our engagement with Senior Managers allowed us to work towards a common vision and develop mutually supportive and attainable goals.

Language and aadsookaanan reconstruction and revitalization is an organization wide goal and will impact our existing service delivery models. For example, upon the completion of the aadsookaanan reconstruction work, our Social and Health Department, will utilize this work to reconstruct our rites of passage and develop a service model based on the rites of passage. Another example is the re-visioning of our dispute resolution policy and the alignment with the ancient teachings contained in our aadsookaanan. A review of our Human Resource Strategy will be conducted in light of the availability of immersion video that will create understanders.

As for STEM, our departments will be providing support, in terms of placements, special speakers, student co-op work opportunities, and STEM related summer employment. Our Senior Management Team are committed to creating the necessary supports, as per the findings of our on-going evaluation and project implementation, to ensure successful attainment of our goals.

The primary engagement tool we utilized with leadership was holding face-to-face meetings both collectively and individually. This method was selected in order to facilitate critical thinking and extensive discussion. Leadership was also represented at all of our other stakeholder engagement sessions. On-going engagement with this particular group is of extreme importance to the success and continuation and growth of our Smart Cities proposal.

Continued engagement will occur through the existing structures that will facilitate on-going connections between the proposal implementation team and the leadership. Senior Management will be responsible to engage their respective staff members. Regular meetings will occur throughout the life of the project, in addition to regular reporting and evaluation. The governing team responsible for the Smart Cities project will have a representative from Council and Senior Management appointed to ensure successful implementation and alignment of goals.

Biigtigong Aadsookaanan Group and Elders

Our elders and traditional knowledge holders are considered major stakeholders in this project. Following our cultural protocols, these groups have been involved in the planning and development of our proposal, including our initial application. Our approach to engagement with our elders usually occurred in informal settings, not in a boardroom. We respected their approach in transferring knowledge and providing direction through the use of stories and personal accounts of life experiences. Individuals from this particular group have directly experienced the affects of residential and day school systems. They are able to speak first hand regarding the loss of language, the loss of their stories and methods of transferring cultural knowledge and the trials this has caused in their lives and those of their family. They are motivated to create opportunities to reconcile the impacts from this part of our history.

Through our engagement processes, these stakeholders provided strong support for the use of technology in the creation of understanders of Nishnaabemwin (our language) and the transfer of traditional

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knowledge contained in our Aadsookaanan (sacred stories). Many understood the power of technology due to their involvement in our language reconstruction and documentation project. From first hand experience, they saw the data that everyone contributed and the research data, along with technology, successfully aid in reconstructing our language. Most of our elders and knowledge keepers realize that language revitalization in our community is impossible without the use of technology. Additionally, they felt that making our language and stories available on-line, was the best means to reach our youth. With only one proficient speaker left in our community, taking the data available through our language and making this accessible for everyone, forever, and utilizing immersion, on-line, provided hope and reconciliation.

They also asserted the importance of having our youth and our elders/knowledge keepers interact in real-life experiences. Our elders reminded us that our way of life is tied inherently to the land and more to a specific place. In order for us to transform our youth into better-educated, more-employable, better-grounded and more holistically Nishnaabe, we must keep them connected to their territory and the teachings that can only come from intimate relationships with the trees, birds, fish, wind, rain, rocks and every part of existence. They stressed the importance of our land-based curriculum and the need to build their relationships with Mother Earth.

The primary engagement tool used to obtain input from this target group was the use of face-to-face informal meetings. We followed cultural protocols, with the passing of tobacco and observed the traditional methods of knowledge transmission. We smudged, sang, feasted, told stories, laughed, cried, talked, listened, remembered our ancestors, sat in silence, and together made decisions in the best interest of seven generations.

Our elders and traditional knowledge will continue to play an integral part of our Smart Cities proposal implementation. The role our elders play in our world is very explicit as defined by our cultural protocols. We are responsible to acknowledge their role and facilitate the inter-generational transfer of knowledge, in a culturally appropriate manner. Our proposal sets out formal and informal on-going space for the involvement of our elders and knowledge keepers. Cultural norms dictate that we are accountable to our elders and as just this guarantees that they will be meaningfully involved in this proposal.

Biigtigong Youth

Our youth are the center of this proposal and are the main beneficiaries and reasons for this proposal. Part of our engagement strategy for this group, included the examination of results and other engagement sessions held by other community projects. We utilized this information to augment the information we obtained through our engagement sessions.

Through surveys and personal interviews with our youth, they expressed the need to be better prepared for the technological world. Additionally, they felt it was important that having a strong sense of their Nishnaabe identity was essential to their success. Not having been exposed to their traditional language and what it contains, our youth do not understand the profound sense of loss that our culture has suffered or the depth of the benefits one can receive from acquiring their language. Our initial application failed to identify this as a potential drawback to achieving our outcomes. This is addressed in our final proposal by creating a series of videos that provides an inside look at the philosophy embedded in the language and how it expresses our unique worldview. It is our intention that these videos, along with teachings from our elders, will provide our youth and other community members with the motivation to begin their language acquisition journey.

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We engaged the youth through some of their established groups. Additionally, we hosted special events at their local high school, sponsored community events, conducted a youth survey, and talked to them in various public functions and locations. Several new initiatives are currently underway with our departments that aim to increase youth involvement. Our Smart Cities team have provided input into the establishment of these new initiatives and will utilise these structures to increase youth engagement. They new approaches are youth-driven.

Parents

Projects aimed at our children will be more successful with the support of their parents. Our parental engagement findings showed an overall support of the proposal. Parents understood the importance of preparing our children and youth for the technological world. Additionally, they acknowledged the importance of language, culture and land to identity and how this was important to living good lives.

One of the biggest impacts resulting from our consultations with parents was their personal fear in not having knowledge of STEM or the language. This translated into building into our proposal strategies to help educate our parents and provide resources on how they can support their children's language acquisition and STEM learning journeys. Including supports for parents has now become an important addition to our proposal. We will incorporate strategies that facilitate family learning. Overall, the parents were excited about the new possibilities for their children and several thought perhaps they should go back to kindergarten.

Parents understood that this proposal would produce understanders of the language. They wanted reassurance that the resources necessary to move from being an understander to becoming a speaker will be available. Our 2019 survey and 2006 survey clearly state that language revitalization is a community priority and creating speakers is our ultimate goal.

We utilized surveys, community meetings, and small group discussions, as the means to obtain parental engagement. Our education staff took opportunities inside their system to engage the parents and introduce them to STEM. We have strengthened our strategies to encourage and empower our parents as they support their children's education journey. Continued parental engagement throughout the proposal implementation is important to achieving the outcomes for our children.

Biigtigong Education Staff

Biigtigong has a well-established, creative and results-driven Education team. Their participation in the development of the proposal has been important and has resulted in substantial contributions to ensuring the successful implementation of our proposal. They have identified solutions to potential problems and have substantially improved the quality of the proposal.

They have been extensively involved throughout the entire process, from visioning, to curriculum reviews and development, education philosophy and pedagogy reviews, assessment and evaluation development, privacy and data, student needs and support, student learning styles, immersion video production, professional development and capacity building, co-operative education models and re-imaging a new education model. The application of the resources developed through this proposal will be subject to the rules and regulations of the Education Department. The education department will maintain responsibility for the monitoring of individual student assessments and the overall education mandate.

Through pilot projects and professional development initiatives, the staff had the opportunity to facilitate student learning in the area of technology and engineering. This was particularly challenging, as the

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teachers had little to no knowledge of either fields or experience using on-line resources in these fields. This work resulted in wonderful lessons but the most important take away is the creation of a team excited to take on the world of technology, engineering and language acquisition. Our education department and our Smart Cities team has developed a training strategy to support teachers with STEM, language and and blended learning education.

One of the major changes resulting from the engagement with the education staff relates directly to our initial goals in the secondary school program. The staff highlighted the limitations of secondary level courses as it related to our initial vision. As a result, we had to go back to the drawing board and find other ways to implement our vision. This turned out to be such a wonderful problem, which initially seemed insurmountable. This led to the development of a much more supported and comprehensive high-school program. It now provides high-school credits, real technology and engineering co-ops, summer internships and employment, youth owned and run business, career support and mentorship.

Our engagement with our education staff has been extensive and will continue to be so. We have utilized surveys, focus group discussions, small group discussions, pilot projects, training sessions, staff meetings, on-line resources, collaborative tools, and cultural events to engage our education team. We have created an organizational culture that supports and empowers our staff. The success of our Smart Cities proposal is increased by meaningful engagement and empowerment of our Education team.

Off-Reserve Members

The Smart Cities proposal provides an opportunity to strengthen the community bonds between on-reserve and off-reserve members. Through our on-line platform, off-reserve members will have the opportunity to access important community data relating to their language and aadsookaanan. Additionally, they will have access to any programs developed by the community that support STEM on-line. The meet-up-app will also help facilitate opportunities to return home to their traditional territory and participate in person with the community.

Our off-reserve members indicated support for the proposal goals and were excited about the opportunity to acquire their language from the comforts of their home. Engagement results reiterated the need to more effectively utilize technology to build stronger relationships and inclusion of off-reserve members into the building of our Nation.

Our engagement with off-reserve members included a survey, a meeting in Thunder Bay, availability of live-streamed community meetings, conference call meetings and web-site information. Our plan moving forward includes strategies to increase off-reserve participation and engagement.

Community Members at-large

Various engagement activities were held for the general population. These events included, luncheon talks, large community presentations, small group sessions, social events, survey, live-streamed community meetings, newsletters, web sites, email and social media. We received tremendous support for the project through the high levels of participation in the engagement sessions. Our general sessions were well attended and our survey return rate was high. The responses shaped our proposal by confirming we are on the right path and the community is behind the goals set forth in our proposal. Community support is very important to the successful implementation of our proposal. It does take a whole community to raise a child.

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STEM Professionals and Academia

In order to ensure our proposal is academically feasible and provides a solid foundation for entry into related post-secondary programs or employment fields, we engaged various STEM professionals from the business and academic sectors. The information and insights provided by this group has significantly impacted our proposal. They played instrumental roles in selecting the curriculum and developing a sequencing of skills and knowledge. Their expertise provided us with the guidance to develop a high level K-12 STEM program, with ambitious and achievable goals. Their continued involvement in the project will ensure our programs meet the needs of our students and the ever-changing needs of the industry.

Engagement Tools

A variety of methods were used during the proposal development stage to achieve high participation rates amongst the stakeholders. Upon the completion of stakeholder analysis, where a careful review of the potential risks, interests and benefits were identified, engagement strategies were designed to suit the specifics of each group. Engagement tools were purposely selected and customized for each of our stakeholder groups. In addition to selecting appropriate tools, the presentation itself was customized for the specific audiences.

Individuals who had experience working with each of the stakeholder groups were invited to assist in the design and the development of a best-suited approach to the consultations. Involving these individuals increased our efforts of engagement to produce meaningful results and strong community buy-in and support. A list of tools used is attached as Appendix Z.

Summary of Engagement to-date

Our engagement plans to date has resulted in the successful participation from our residents and the diverse stakeholders of the project. We believe our processes were meaningful and facilitated honest and open discussions. As a community, we explored the potential barriers and risks to our success and found creative solutions to address them. We embraced the opportunities and strategically developed a difficult but implementable proposal that will make profound impacts forever. We understand the importance of engagement and make this foundational to how we build our Nation.

Part III: Engagement During Implementation

We are building upon the successes of our engagement during the final proposal development phase. Our plans for engagement during the implementation stage are aimed to foster high levels of community engagement from the diverse stakeholders. The engagement processes are intended to ensure the needs of the community are being met and the program meets its expected outcomes. The engagement process will foster community development, inclusion and provide a rallying point for members to make meaningful contributions to helping transform our youth into better educated, more employable, better grounded and more holistically Nishnaabe people.

Formal Leadership

The following will be implemented to ensure meaningful and continued engagement with our formal leaders to support the attainment of the proposal outcomes:

1. Smart Cities Executive Board: The Chief and Council and the Senior Management Team will each have a representative on the Smart Cities Executive Board. Each will be coordinate engagement with their respective group.
2. Senior Management Team: An Executive Board representative will participate in quarterly meetings.

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3. Bi-monthly report: A video report will be made available to provide education, accountability and foster engagement on the project.
4. Annual Report: Produce and annual report to Council, Senior Management and Community.
5. Ceremony: Elders will be invited to an annual ceremony where we honour the goals of our proposal and ask for help and guidance from our ancestors.

Elders

The following will be implemented to ensure meaningful and continued engagement with our elders to support the attainment of the proposal outcomes:

1. Aadsookaanan Working Group: This group is comprised of elders, language carriers, traditional knowledge holders, youth, parents and technical personnel. They will work collectively with the aadsookaanan research and reconstruction team. They will act as the advisory body and assist in the decision-making process regarding aadsookaanan reconstruction. Additionally, they will report to the Executive Board who is responsible for the overall proposal. This group will remain in affect for the entire implementation stage and will meet no less than quarterly and more frequently when required. The group will coordinate community engagement sessions regarding the aadsookaanan project to keep the community informed and involved.
2. 50+ Elders Group, TEK Working Group, Place-Name Reclamation Working Group: Bi-annual engagement events will be held specifically with each of these existing community elder groups.
3. Pop-Up Engagement Sessions: We will host at minimum one pop-up Smart Cities fun and informative pop-up engagement session. These sessions will be held in support of existing annual community events, such as, moose-camp, addictions awareness week, fish-camp.
4. Ceremony: Elders will be invited to an annual ceremony where we honour the goals of our proposal and ask for help and guidance from our ancestors.
5. Bi-monthly Report: A video report will be made available to provide education, accountability and foster engagement on the project.
6. Annual Report: Produce and annual report to Council, Senior Management and Community.

Biigtigong Youth

The following will be implemented to ensure meaningful and continued engagement with our youth to support the attainment of the proposal outcomes:

1. Executive Board Seats: Two seats on the Executive Board will be reserved for youth representation. The seats will hold the same responsibility and influence as all other seats on the committee. The youth representatives will be responsible for coordinating the youth engagement strategies.
2. Biigtigong Youth Council: We will utilize the Youth Council to assist in the coordination of joint initiatives aimed at youth engagement.
3. In-school Engagement: We will host one in-school engagement session per semester.
4. Pop-Up Engagement Sessions: We will host at minimum one pop-up Smart Cities fun and informative pop-up engagement session. These sessions will be held in support of existing annual community events, such as, moose-camp, addictions awareness week, fish-camp.
5. Formal Evaluation: Our youth will be involved in the evaluation of the proposal activities and in the development of strategies to strengthen the program.
6. Celebration of Achievements: A celebration of student achievements as they r elated to the outcomes of this project will be planned each year.
7. Bi-monthly report: A video report will be made available to provide education, accountability and foster engagement on the project.
8. Annual Report: Produce and annual report to Council, Senior Management and Community.

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Parents

The following will be implemented to ensure meaningful and continued engagement with our parents to support the attainment of the proposal outcomes:

1. Education Committee: An Executive Board member will work with the Education Committee to engage and inform parents.
2. Child and Family Learning Centre Parent Committee: An Executive Board member will attend 1 parent meeting per year, or as requested.
3. Existing In-School Parent Engagement Activities: Parents will be engaged through parent-teacher interviews, open-houses, progress reports, on-line media and other in-school engagement processes.
4. Parent and Student Cohort Support Program: A special program will be set up for the parents and students for the 2019 cohort moving into the CompTIA A+ program. This program will provide various support services for the duration of the program. Parents will have an opportunity to help adapt the program in order to better serve youth success.
5. On-line workshops for parents: A series of on-line interactive workshops will be held for parents to help them engage in the learning journey of their children.
6. Formal Evaluation: Our parents will be involved in the evaluation of the proposal activities and in the development of strategies to strengthen the program
7. Bi-monthly report: A video report will be made available to provide education, accountability and foster engagement on the project.
8. Annual Report: Produce and annual report to Council, Senior Management and Community.
9. Pop-up Engagement Session: We will host at minimum one pop-up Smart Cities fun and informative pop-up engagement session. These sessions will be held in support of existing annual community events, such as, moose-camp, addictions awareness week, fish-camp.

Off-reserve Members

The following will be implemented to ensure meaningful and continued engagement with our off-reserve members to support the attainment of the proposal outcomes:

1. Off-reserve meetings: A minimum of one in person meeting will occur with off-reserve members.
2. Live-stream video: All community meetings will be live-streamed to encourage off-reserve members.
3. Webinars: 2 Webinars will be held annually for post-secondary students and off-reserve members.
4. Formal Evaluation: Our youth will be involved in the evaluation of the proposal activities and in the development of strategies to strengthen the program
5. Bi-monthly report: A video report will be made available to provide education, accountability and foster engagement on the project.
6. Annual Report: Produce and annual report to Council, Senior Management and Community.

Community at large

The following will be implemented to ensure meaningful and continued engagement with our community to support the attainment of the proposal outcomes:

1. Community Meeting: A minimum of one in person meeting will occur with on-reserve members.
2. Live-stream video: All community meetings will be live-streamed to encourage off-reserve members.
3. Nishnaabe Clan System: A new engagement system based on our clan system will be introduced for the first time. This is an extensive engagement process that is designed to include all sectors of the community. This system will be used as one of our primary methods of community engagement.

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4. Formal Evaluation: Our youth will be involved in the evaluation of the proposal activities and in the development of strategies to strengthen the program
5. Bi-monthly report: A video report will be made available to provide education, accountability and foster engagement on the project.
6. Annual Report: Produce and annual report to Council, Senior Management and Community.

Nishnaabe Clan System

Reconstruction and reclamation of our ancient Nishnaabe ways is a central to our vision. In keeping with the spirit of our vision, we intend to utilize our traditional clan system as the primary method to our engagement strategy. The clan system is built upon principles that are foundational to our world-view and philosophical understanding of our world. These principles capture cultural values, such as, non-hierarchical structures, cooperation, collaboration, reciprocity, communal living and promotes the importance of relationships.

Our clan systems are reflective our cultural structures that emerges from our relationships with the land and a naturalistic cosmology. We look to the natural world and the laws that exist on the Earth, as our guiding principles for the development of our systems and structures. Our clan systems consist of seven primary clans: Loon, Crane, Fish, Bird, Bear, Marten and Deer, each having several sub-clans. Each clan has adopted a spirit animal as their totem and this animal is a symbol of how the members of each clan should conduct themselves and relate to the world.

This system organizes work and establishes responsibilities of individuals and the collective. Each clan holds specific duties and responsibilities to take care of the physical, mental, emotional and spiritual needs of the community. Some of these responsibilities include, philosophy, law making, decision-making and enforcement, governance, learning and teaching, communication, economics, trade, defense, child rearing, providing, conflict resolution, and strategy. The clan teachings are agreements that govern how individuals and families take care of each other and the community as a whole.

We are choosing to implement our clan system for the first time within a modern context. We will utilize the clan structure and protocols for the purpose of community engagement. Each clan will appoint a representative to the main clan body. The main body will work with the Executive Board, to determine the most effective and productive strategies to empower and engage our residents. Each clan leader reports directly to his/her clan and the clan determines how they will involve the members of their clan in the process. Clans determine their own internal methods of communication and decision-making. Individual clan decisions are brought back to the main clan and our consensus decision-making model and dispute resolution models will govern the process. This is the basis of our engagement plan.

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Risks and Mitigation Strategies

Our approach to risk and how we determine and mitigate or avoid risk is discussed in Chapter 3. This table summarizes the risks associated with community engagement and the risk management approach and mitigating actions to be taken.

Risk	Likelihood	Impact	Risk Management Approach/Mitigating Actions
Lack of Support of the proposal	Low	High	• Establish meaningful process • Be accountable & report • Provide education
Loss of faith and trust if there is no consistent follow-up by staff.	Low	High	• Establish measureable goals. • Plan for short term achievements • Set achievable action plans • Be accountable and transparent
Unrealistic stakeholder expectations and demands.	Medium	Medium	• Be clear about the reasons for engagement • Clear and consistent communication • Provide education • Dispute resolution process
Lack of interest	Medium	Medium	• Select group appropriate strategies • Know your audience • Ensure the activities are fun, social and specific to your audience
People made feel excluded	Low	Medium	• Use existing networks and structures • Provide several opportunities for people to have input • Ensure culturally appropriate methods • Customize approach to audience we
Limited knowledge on clan system	High	Medium	• Utilize knowledge holders in community • Conduct research • Bring in elders who know about clans • Training • Ceremony
Triggers trauma – direct and inter-generational	Medium	High	• Create awareness of possibility – share previous examples/similar stories • Include ceremony • Social Services support programs • Cultural Coordinator support programs
Don't meet outcomes	Low	High	• Set up good planning • Realistic outcomes – needs based – measurable • Set up reporting and accountability • Supportive budget, governance systems, management system
People are not aware of what's going on	Medium	Medium	• Communications plan • Use various approaches to inform people • Be creative – go to them
Lack of time	Medium	Medium	• Live stream meetings • Use BiigtigongX • Provide information to them – video, tv, print, car, phone • Make it interesting, fun and useful

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Chapter 7: Privacy

Introduction

Privacy is of the utmost importance to our leadership, project team and community as a whole. Given that this project entails a blended learning environment of both online and real-world opportunities this project will result in the generation of new data from users creating accounts on the Open edX platform. As such, it is critical that this project be developed and implemented with significant consideration given to privacy and data security. The following chapter outlines our data management plan.

Preliminary Privacy Impact Assessment (PIA)

Given that this project involves the collection of some personal data, it is necessary to complete a Privacy Impact Assessment (PIA). In preparing this proposal, the project team has completed a preliminary privacy impact assessment through reliance on applicable regulations and our internal governance strategy and through incorporating feedback from the Office of the Privacy Commissioner of Canada. The PIA is submitted under separate cover.

The Preliminary PIA covers all proposed activities under the SMART Cities project, including how data will be sourced and accessed through the Open edX platform. Considerations have also been made for: Data Storage, Data Access, Data Retention and Data Disposal required throughout the lifespan of this project. The project team will continue to assess the project's privacy risks and impact to determine if there is a need to update the privacy analysis and/or the PIA report. This ongoing assessment is an essential part of identifying and mitigating new issues and changes impacting privacy that may arise during the implementation phases.

This Chapter of the Smart cities Challenge includes much of the information includes in the preliminary PIA, as well as additional details as specified.

Compliance with Applicable regulations.

The following table outlines the result of our compliance analysis:

Policy Process Statement	Process and Compliance measures
Purpose of the collection of personal information	This project involves creating a blended learning environment with both online and real-world components. The nature of an online learning environment results in the collection of minimal personal information to create an account, name, user name and password. Additionally, certain functionalities of the Open edX platform, such as the meetup application or time spent watching videos, will also generate data on a user's location and behavior patterns. Another source of data is the videos, stories, overdubbing etc. that will be created for the language immersion education and STEM bilingual courses portion of the project. This data will be stored on the Open edX platform as well as in a redundant hard-copy format (ie, transcripts, tapes etc) to ensure data is not lost. There are no additional privacy concerns associated with storing physical copies of the educational materials. All information identified is absolutely necessary for participating in the project and/or for monitoring the success of the project

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Source of personal information/ Accuracy	Initial data will be provided directly by users to generate their profile and then data will be tracked using their Open edX account. For example, it will be necessary to track users time spent watching video to provide assurance that the student has completed the necessary videos for completing the curriculum requirements. Given that the curriculum will be developed in a blended learning environment (brick and mortar and online) this will only include the collection of data related to activities completed in the Open edX platform. Activities completed within the brick and mortar school will continue to be tracked by teaching staff under existing processes. Qualitative data will also be collected by teachers for users to inform feedback on the project, monitoring, evaluation and control purposes. Personal information will be collected directly from the Open edX platform by teaching staff only. Collection of data from teaching staff will be required and is appropriate given the context of this project. Given that information is provided directly by the user through the online platform, we do not anticipate any major inaccuracies. Likewise, the anonymized and summarized data to be provided by teaching staff is subject to their current process which ensure accuracy and privacy of student information.
Accountability and Openness	The project team is accountable for the data collection, management and safeguarding results from this project. The project team has intentionally minimized the amount of personal information to be collected through use of Open edX platform, as users will only need to provide their name, user name and password to create an account. Likewise, we will implement a process that enables students and their legal guardians to provide informed consent to participate in this voluntary process, thus ensuring they understand what information will be collected, why, and who will have access to it.
Manner of collection of personal information	The data to be collected is minimal and relatively not intrusive. It is similar (if not identical) to the information already being collected and managed by the school system. Similarly, the information collected via the Open edX platform is typical for any online platform. Use of the meet up application is voluntary, and any users will be provided a privacy statement to agree to prior to using this forum (i.e. authorizing sharing of user location data)
Limiting Use, disclosure and Retention	Teaching staff are already subject to policies and codes of conduct that govern how they treat personal information, through to physical or technical controls that protect the information. Safeguards that will be into place include physical security; IT security; staff training; policies, confidentiality clauses in contracts with external providers etc. Information, such as language videos, transcripts etc. are to be stored indefinitely as these are important records of our language and traditional teaching that we are attempting to preserve as part of this project. Personal information will only be used for the purpose it was collected for, and as described. The personal information collected for the students will only be retained until graduation. Following successful graduation, all student data will be removed from the server and student accounts will be disabled.

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	The collection, use, retention and disclosure of personal data, and particularly student data, should always be limited to what is necessary to fulfil authorized purposes. Reducing the risk posed by the excessive collection of student data is a core principle that guides this project's data processing practices.
Access and correction to personal information	Users will be able to access the account information on the Open edX platform. Information collected by teachers will be subject to the policies and procedures currently in place in the school system. Information will be shared with students and parents through existing channels (i.e. report cards). Access logs will be implemented to track access to personal information. Teachers can correct their existing report card writing process based on information collected. For example, should a student choose not to use the meet up forum, the teacher would reflect the true involvement in traditional activities in that student's report card, regardless of the data output from Open edX. Requests for personal information to be corrected will be handled on a case by case basis. However, we do not anticipate any major concerns with meeting this principle as all information collected is basic in nature and expect most changes, if any would be minor in nature such as their name, username or password changes.
Accuracy etc. of personal information	Given that information is provided directly and automatically by the user through the online platform, we do not anticipate any major inaccuracies. Likewise the anonymized and summarized data to be provided by teaching staff is subject to their current process which ensure accuracy and privacy of student information. The process for anonymizing the data will involve the teaching staff providing the project team a summary report detailing quantitative data needed to provide details needed to track and report on performance indicators. This will include: • number of K-12 STEM courses successfully completed by K-12 students • number K-12 students needing remedial help in STEM subject areas • number of K-12 students who know the key concepts expressed in each of our core aadsookaanan • participation rate in number of traditional Nishnaabe activities for K-12 Students No personal or identifying information will be shared, nor will it be required, by the project team. The summarized data, omitting all personal information, is required by the project team to track, monitor and evaluate the implementation of the project, and to make course corrections when necessary. Qualitative data will also be collected for teachers to provide feedback on the project, for monitoring, evaluation and control purposes.
Data Disposal	Data stored on the Open edX platform will be expunged following a student's graduation.

Data Management process

This section outlines the types and methods of data collection, generation, analysis, storage, and preservation that reflects the entire data lifecycle in project design. The Data to be collected during this project is associated with the inputs and outputs, as described in our performance measurement strategy presented in Chapter 2.

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Step 1: Gain informed Consent:

In order to ensure participants (and their legal guardians) make an informed decision when providing their consent to participate in the Open edX platform, a privacy seminar will be held at the community centre prior to program roll out. During this seminar, the project team will review the project and the content of this Privacy Impact Assessment to ensure participants (and their guardians) are knowledgeable of the inherent risks of participating in a partially-online learning platform. This seminar will overview what information will be collected and why, who will have access to this information once an account has been created and what agreements are in place (at that time) with all 3rd party providers. This seminar will also allow community members to voice their privacy concerns with respect to participating in an online environment. The project team will also present the policies and procedures developed thus far to mitigate any identified privacy risks and how any data breaches will be managed, as described within this document and further iterations of the PIA.

Should students, or their legal guardians, opt-out of the online-augmented (i.e., blended-learning) program, they will be given alternative means of participating in the k-12 curriculum at the brick and mortar school. It is important to note the participation in this Open edX platform is 100% voluntary and if not adopted will not diminish the learning of non-participates. Participants and their guardians will be provided a consent form outlining the privacy concerns and risks, for review and signature prior to enrolling in the Open edX platform.

Its should be noted that as outlined in the PIA, in an effort to mitigate risks, the project team will work with Technology/Software providers, including Open edX to enter into a contractual agreement which will ensure personal information is handled in a privacy-compliant manner, and restricts the third party's use of personal information for proposes outside the project scope. In all cases the user will be advised about any third party's privacy policies/statements when directed to a third-party site for additional links or resources, as part of informed consent process.

Step 2: Personal Information Data Collection

Users of the Open edX platform will be required to provide the following types of personal information. This information will then be use by teaching Staff to offer better service to participants.

- Account creation and login information, including user name and password *
- Location information - anytime the student interacts with Open edX platform, location data is generated **
- Patterns of behaviour (which educational video were watched and for how long)

*Students will not be asked to provide their address, date of birth or other identifying information for the purposes of setting up an account with Open edX. The intent of collecting a user name and password is only to allow a student to create an account and login to the Open edX platform and to enable teachers to track a student's progress.

**Due to the very nature of the internet anytime a person connects, the media that is being delivered to that person is tracked using a particular 'IP address.' Location data is then deduced from that IP address. There is no reasonable (or perhaps possible) way to interact with the internet without generating location data. Total location privacy is not possible within the current

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organization of the internet since IP addressing is a foundational part of the internet. As such we can only attempt to maximize our privacy online - while accepting that our location will always be exposed.

Step 3: Data Analysis

Information to be collected will include the name/user name of the student and the amount of time a student spends watching a video, as well as any participation in any traditional activities as tracked through the meetup forum functionality. Similarly, should students identify participation in traditional activities through the meetup forum functionality of Open edX, this will generate location data.

No additional information will be provided regarding the student's performance in other school programs. Again, this is a voluntary blended-learning environment (online and/or brick & mortar, but not online only) and therefore the intent is to not replace what is currently being done at the school level. All collection of student data will be limited to what is needed for educational purposes.

Teaching staff are the only project resources who will have access to the student specific data. No other project team member will have access to individual student specific information. No information will be made public. Teachers require access to student specific data as it is needed ensure a student has completed the required curriculum. Behaviour data is also required to make teachers aware of how long a student struggled with a particular math problem, or how many times the student rewatched a video, and which sections of the video were rewatched, for example. This is one of the main benefits of using a blended-learning approach as this "behavioural pattern" data is what helps our teachers teach more effectively.

Teachers will not provide information about a student to Open edX nor to Appsembler. The flow of information is from student to Open edX to teacher, which is then provided back to the student in the form of a report card and to the project team in the form of aggregated summary data for performance measurement tracking only. In other words. Teachers will summarize the data and submit to the project team for performance monitoring and process improvements. I

With respect to information collected by 3rd parties, this will all be as per the contractual agreement. All terms of these agreements and risks to privacy resulting form 3rd party platforms and software will be communicated to users (and guardians) as part of the informed consent process.

Step 4: Store and Dispose of Data

Minimal student data will be stored on Open edX platform, over the course of their school. Data stored by teachers (i.e. in the form of records and report cards) is governed by their existing policies and procedures. With respect to input data such as the videos, stories, overdubbing etc. that will be created for the language immersion education and STEM bilingual courses portion of the project. This data will be stored on the Open edX platform as well as in a redundant hard-copy format (ie, transcripts, tapes etc) to ensure data is not lost. There are no additional privacy concerns associated with storing physical copies of the educational materials.

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All information identified is absolutely necessary for implementing the project, participating in the project and/or for monitoring the success of the project. Student Data stored on the Open edX platform will be expunged following a student's graduation.

Other Uses

There are no plans for and transmission, and plans for re-use, re-distribution, derivative production, archiving, student personal data. All other data, including videos, are to be made publicly available.

Open and Big Data Strategies

Only once this framework is expanded to different communities with different objectives will the use of big data be necessary to track the different uses and functions of this curriculum. At this point, open data will be used to report progress, engagement, best practices, etc. This information will not pertain to specific individuals, but specific user bases as whole. For example, data may summarize user rates, and immersion progress of a specific community, but not specific students of that community.

Privacy Risks and Mitigating Strategies

Risks and Mitigation Strategies are discussed throughout this chapter (and others). Three key risks are summarized in the table below:

Risk	Mitigating Strategy
Use of information by 3rd parties	The project team will work with Technology/Software providers, including Open edX to enter into a contractual agreement which will ensure personal information is handled in a privacy-compliant manner, and restricts the third party's use of personal information for proposes outside the project scope. In all cases the user will be advised about any third party's privacy policies/statements when directed to a third-party site for additional links or resources, as part of informed consent process.
Security Breach	The project team will develop and implement a breach response policy and protocol that addresses privacy and security risks for both the online and offline platform/storage methods. Information custodians, namely Teaching staff, Chief and council, and the database administrator must immediately contact the Database administer and Privacy Officer, informing him of the following: • the nature of the breach; • the information that was exposed; • to whom it was exposed; and • for how long it was exposed. The Information Custodian will work with the Privacy Officer who will advise whether notice to affected individuals and the Office of the Information and Privacy Commissioner of Ontario (IPC) is required. If such notice required, the Privacy Officer will work with the information custodian to meet the needs of the IPC.
3rd party software/technology becomes outdated	Reliance will be placed on existing websites for STEM education (i.e. code.org). As these are established organizations, that are constantly updating and revising content to better engage youth and other users in this field, there is some chance that this 3rd party software at some point may become dated. However, SMEs will continuously monitor content and explore alternatives should the desired content become outdated or unavailable

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Chapter 8 - Financial Management Plan

Introduction

Biigtigong has a responsibility to its citizens to accurately account for public funds, to manage its finances effectively and efficiency, and to plan to provide quality needs-based services. As a government we are responsible for implementing effective systems of public financial management and for utilizing these systems to safeguard public assets. The effective management of public finances is fundamental to the development and growth of the community.

Financial management is a critical prerequisite for success. It is an integrated process that brings together strategic planning, budgeting, accounting, reporting, controls, procurement, auditing, policy and people with the goal of managing resources strategically to achieve the project's outcomes. Effective financial management includes planning, organizing, directing and controlling the financial activities to support the organization's goals.

Authority

Biigtigong's Constitution assigns Chief and Council the responsibility to effectively and efficiently manage and control public funds. They have the authority to establish institutions and appropriate legislation, polices and procedures, with supporting governance structures, to govern the financial matters of the First Nation. The Constitution recognizes the leadership's responsibility for accountability, transparency and results.

Financial Management Objectives

Biigtigong's financial management objectives are as follows:

- To enable the delivery of quality services to our membership that are geared to meet their needs.
- To make effective and efficient use of the available resources.
- Be accountable to our membership and other stakeholders.
- Prepare for long-term sustainability.
- Manage risks.

Sustainability and Diversification

The goals of our Smart Cities proposal are aligned and part of Biigtigong's bigger and longer-term vision. As such, it is not considered an independent project, with a start and end date. Our five-year implementation stage is designed to develop the necessary resources and capacities to ensure long-term sustainability of the program goals and objectives. As we begin our implementation, collaborative efforts with our internal departments on specific aspects of our proposal are setting the stage for long-term sustainability and integration.

Governance Structure

Establishing appropriate governance structures that support and facilitate the delivery of our programs and services to our membership is part of an effective financial management plan. Chapter 5 describes the governance structures.

Responsibilities

Establishing clear roles and responsibilities and ensuring a shared understanding of these roles are important to sound financial management. Financial management roles and responsibilities are defined in the financial polices. In addition, these are reiterated in the details of job descriptions, department

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mandates and terms of references for committees and boards. All of these are in place for the Smart Cities proposal implementation.

The Chief and Council's primary responsibility is to establish appropriate laws and policies to govern the sound financial management of finances. Management is responsible for the implementation of these laws and policies and ensuring adequate procedures and systems are in place for support. Management is responsible for communicating the expectation and duties to staff. Staff and operating personnel are responsible for carrying out the internal control activities set forth my management.

Transparency

Creating a culture of transparency throughout the organization is one of the foundations of sound financial management. Developing principles of careful budgeting, reporting and auditing, combined with internal controls and transparency ensures a robust system of financial management.

The following provides some measures that Council has taken to provide transparency:

- Open Council meetings; public access to by-laws, minutes and reports.
- Council publishes the annual approved budget and financial statements.
- We have expanded our Internet and social media presence including some online services.
- Feedback and complaint mechanism are in place.
- Procurement policy is comprehensive and regulates the procurement of goods and services, including human resources.
- Conflict of Interest policy guides the disclosure and management of conflicts of interest.
- Codes of Conduct are established for members of Council, management, staff, committee members and the membership.
- Public access to information is guided by policy.
- Extensive community engagement culture; continuous opportunity for community to be involved in the decision-making processes.

Our Smart Cities team will adhere to the regulations and expectations established by Council via their formal and informal policies. Our team is committed to building an open and transparent relationship with all of our stakeholders. Transparency is of special importance to our team, as we are making new paths and facilitating a significant change at the community level and establishing trust is important. We will create opportunities to be transparent and ensure our organizational culture and systems support transparency.

Rigorous Internal Controls

Internal controls ensure that the organization is in compliance with laws and regulations and protects assets against theft and misappropriation. In general, segregation of financial duties to provide a set of checks and balances, proper authorization of expenditures, physical control of assets, and maintenance of records and documents supporting financial activities are the foundation of an adequate control environment. Sound financial management also requires regular reconciliation and review to ensure that activities reported in the organization's accounting records are crosschecked against the supporting documents.

Internal control is all of the policies and procedures management uses to achieve the following goals:

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- Safeguard assets - well-designed internal controls protect assets from misappropriation of public funds, accidental loss or loss from fraud.
- Ensure the reliability and integrity of financial information. Internal controls ensure that management has accurate, timely and complete information, including accounting records, in order to plan, monitor and report business operations.
- Ensure compliance - Internal controls help to ensure the First Nation is in compliance with the many federal and local laws and regulations affecting the operations of our business.
- Promote efficient and effective operations - Internal controls provide an environment in which managers and staff can maximize the efficiency and effectiveness of their operations.
- Accomplishment of goals and objectives - Internal controls system provide a mechanism for management to monitor the achievement of operational goals and objectives.

Our finance policy and operating procedures identify the internal controls that are mandatory for all operations. These controls are regularly reviewed and adjusted accordingly in our efforts for continuous improvement. Our Finance and Audit Committee, in conjunction with our Senior Management Team, provide Council with recommendations for improvement. The implementation of our Smart Cities proposal will be subject to the internal controls and procedures as established by our financial management systems.

Finance Policy Manual

Our finance policy manual is the central means to communicate the financial controls and responsibilities. In order to successfully mange a project a coherent set of accounting procedures and standards are required. Our finance policy manual addresses the following matters:

- Delegated and Assigned Responsibility
- Planning and Budgeting
- Tangible Capital Assets
- Investments
- Procurement
- Payroll
- Benefits
- Travel and Training
- Loans, Guarantees and Indemnities
- Expenditures and Payables
- Borrowing/Debt
- Financial Reporting
- Insurance
- Records Management and Retention
- Risk Management
- Information Technology
- External Audit

Financial Management Software

Biigtigong utilizes a financial management software program named Xyntax, specifically designed to meet the financial needs of First Nations. The software manages all accounting procedures of the organization, such as, cash flow management, general ledger, expenses, payments, assets, income and purchasing. It efficiently manages all financial administrative processes. The software is customizable to suit the specific needs of our organization. The staff who will be assigned the

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responsibility of financial management are familiar with and have extensive experience with the financial management software that will be used for the Smart Cities project. The software will also allow for specific project codes that could coincide with the identified outcomes and milestones.

Accounting Methodologies

Biigtigong utilizes project based accounting. Project accounting tracks all the financial components of a project. It provides access to more accurate and timely information when making decisions. It allows for an actual-to-budget analysis. Project accounting provides for more accurate accounting of project job costs. It provides for a more credible audit process and facilitates better control over projects. Project accounting also can help gauge the team's workload capacities.

Accrual basis accounting

Biigtigong uses accrual basis accounting methods. Under the accrual basis, revenues and expenses are recorded when they are earned, regardless of when the money is actually received or paid. Accrual basis provides a more realistic idea of income and expenses during a period of time. This method requires a careful monitoring of cash flow.

Generally Accepted Accounting Principles (GAAP)

Biigtigong complies with the Generally Accepted Accounting Principles. GAAP is a collection of commonly followed accounting rules and standards for financial reporting. GAAP compliance makes the financial reporting process transparent and standardizes assumptions, terminology, definitions and methods. The purpose of GAAP is to ensure financial reporting is transparent and consistent from one organization to another.

Financial Reporting

We adhere to a regular internal reporting system to ensure we are meeting our financial goals and objectives. Program Directors follow a strict regiment to review financial reports monthly and complete a series of financial tasks. Central to effective decision-making and having the ability to take corrective actions is having access to accurate and timely financial data.

Financial reporting requirements stem from a variety of sources, and financial reports serve many purposes. For example, they serve as tools for use by managers to control their departments and to monitor the extent to which management's objectives are being achieved. They also provide information to external parties on an organization's financial operations and compliance with a variety of requirements. Our Smart Cities management team will adhere to the reporting requirements as defined by Biigtigong and our funding agencies. We will ensure stakeholders have access to timely and accurate reports to allow for good decision making.

For the purpose of our proposal, our reporting system will have to be customized to accommodate the meeting of milestones, as per the contribution agreement. The SC Executive Board will provide regular written reports to the Director of Finance regarding the status of achieving the milestones. These reports will be developed based on the performance reports received from the project implementation staff. These reports will provide the necessary information needed to be the reporting requirements of Infrastructure Canada.

Human Resource Management

Human resource management is a critical success factor for the First Nation and it directly determines the business outputs. Human resource development and management play an important role in the

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overall financial management of our operations. We aim to maximize employee performance and create a supportive organizational culture to facilitate this.

Human Resource Planning

Through effective job analysis and design, we created positions with job descriptions and specifications to meet the needs of the organization and project implementation. The following chart summarizes our human resource requirements to implement our Smart Cities proposal. The majority of the budget will be allocated to human resources, making human resource management especially important to our financial management plan.

Human Resource Requirements – Smart Cities Proposal					
Position	Reporting to	Status	Time Period	Salary Grid Classification	Salary Range
Governance					
Proposal Lead	Executive Board	½ time	5 year	SM2	84,864-95,472
Project Coordinator	Proposal Lead	Full time	5 year	PS3	41,457 -54,092
STEM Implementation					
SC Education Lead	Education Director	Full time	5 year	T2.2	55,500 -81,600
CompTIA A+ Lead	SC Education Lead	Full time	5 year	T2.2	55,500 -81,600
Co-op & Business Coordinator	Economic Development Manager	Full time	5 year	PS3	41,457 -54,092
reBOOT Coordinator	Economic Development Manager	Full time	5 year	EA2	29,766 -38,839
WaaWaa Immersion Video Production					
Immersion Lead	SC Education Lead	Full time	5 year	T2.2	55,500 -81,600
WaaWaa Instructor	Immersion Lead	2 -½ time	5 year	ECE2.2	37,756-49,263
Nishnaabemwin					
Audio Overdub	Proposal Lead	Full time	5 year	Contract	85,000
Bilingual STEM	Proposal Lead	Part time	5 year	Contract	12,500 – 55,000
Meet-up Function					
Meet-up Coordinator	SC Education Lead	Full time	5 year	PS1	37,669-49,149
Technology					
BiigtigongX Administration	Project Coordinator	Part time	5 year	Monthly contract	1,200
Database Administration	Project Coordinator	Part time	5 year	Monthly contract	500

Human Resource Management Tools

Biigtigong uses the following tools to assist in our efforts to maximize employee performance and meet our operational goals and outcomes:

1. Hiring Policies: Provides process to hire, interview, recruit, and determine if you will need to implement training or development for potential or current employees.
2. Termination Policies: Provides process to deal with termination or voluntary resignations.
3. Job Descriptions: Establish clear roles and responsibilities and qualifications.
4. Employee Performance reviews: Provides mechanisms to conduct performance reviews and evaluations of staff.
5. Employee Handbook: Provides a snapshot of our policy guide.
6. Health and Safety Policy: Provides health and safety standards and procedures.
7. Discrimination/Sexual Harassment Policies: Process on how complaints and investigations will be handled.
8. Detailed Policies: Regulations regarding benefits, such as, vacation, holiday, personal, and sick pay, company benefits, salaries, etc.

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9. Required Policies: Required policies are anything that the federal, provincial or local governments require (WSIB, EI, CPP).
10. Specific Policies: Confidentially Policy, Social Media Policy, Cultural Leave Policy.

The Budget Process

The budget process is one of the most important components of successful financial management. The budget process extends beyond the preparation of a document that appropriates funds. Budgeting is strategic nature, encompassing multi-year financial and operating plans that allocate resources on the basis of identified goals. It serves as the performance benchmark for all financial decisions. A budget ensures that an organization can fund its commitments, meet its financial and program objectives and control spending. It allows for measurement of performance and the identification of potential problems. The budget is the overall financial framework.

The development of Biigtigong's Smart Cities budget was done in accordance with the budget policies of the First Nation. The budget was also developed in consideration of the expectations as identified in the Smart Cities Finalist Guide. Our budget supports the implementation of our proposal and the achievement of our goals.

Biigtigong's Annual Planning and Budgeting Schedule

Task	Individual Responsible	Timeline
Annual planning kickoff meeting to present major budget policies, multi-year financial plan direction and guidelines for the strategic plan.	Director of Finance, Senior Management Team, Finance & Audit Committee	3rd week in November
Update Tangible Capital Assets.	Senior Management, Director of Finance	1st week in December
Each Department prepares a thorough analysis & projection of all expenses for the budget yr.	Senior Management Team	2nd week in January
Consolidate all draft budgets including capital budget into one master budget;	Director of Finance	4th week in January
Multi-year plan and strategic plan developed or updated.	Senior Management, Director of Finance	1st week in February
Senior management reviews draft budgets, multi-year plan, and strategic plan.	Senior Management, Director of Finance	2nd week in February
Present budget, multi-year plan, and strategic plan to Finance & Audit Committee for review, discussion, and modification.	Director of Finance, Senior Management Team, Finance & Audit Committee	3rd week in February
Incorporate Finance & Audit Committee changes to any of Planning Documents	Director of Finance, Senior Management Team, Finance & Audit Committee	1st week in March
Inform the membership or involve the membership in consideration of the annual budget and the multi-year financial plan.	Director of Finance, Senior Management Team, Finance & Audit Committee, Council	3rd week in December
Council reviews & approves budget/multi-year plan/strategic plan based on recommendation from the Finance and Audit Committee.	Council, Finance & Audit Committee	3rd week in March
Distribute approved budget and strategic plan to Department Heads and any other appropriate staff and community.	Director of Finance	3rd week in April
Inform membership of approved budgets.	Director of Finance, Senior Management Team, Finance & Audit Committee, Council	3rd week in May
On going monitoring, reporting and reviews.	Director of Finance, Senior Management Team, Finance & Audit Committee, Council	Throughout the year

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Major Budget Considerations

Strategic Plan Integrations

An effective financial management system needs to support the organization's strategic plan and vice versa. It is part of a network of systems bound together to provide high-level services to our membership in order to meet their needs. Sound financial management is critical to the success of long term strategic planning and short term operational planning. Biigtigong has well-established strategic planning processes. Financial management and budgeting systems are designed to facilitate project implementation.

Human Resource Requirements

Once the human resource needs were identified and job specifications determined, the positions were reviewed in relation to our salary grid and policy. The review was to ensure positions are properly categorized according to the criteria established in the policy. Each new staffing position resulting from the Smart Cities proposal has been categorized and is subject to the salary range provided within the grid. Estimates for mandatory employer related costs were incorporated into the budgets.

Contracts will be awarded for the Nishnaabemwin audio overdub work. This will be done in accordance to Biigtigong's procurement policies. The following charts summarize the range of production times to produce 1 hour of video. We conducted some WaaWaa pilots tests and our results varied due to the individual making the video, the content of the video, familiarity of the content, video recording, prop preparation and location. These variables have been considered in our estimations of producing WaaWaa video and overdubbed WaaWaa video. We assume that we will produce video quicker once we have a workflow and some experience in production. We have identified mitigation strategies to address the risks associated with video production.

NISHNAABEMWIN AUDIO OVERDUB PRODUCTION TIME ESTIMATIONS					
Hours of video to be produced each year	**100 Year 1**	**350 Year 2**	**450 Year 3**	**550 Year 4**	**550 Year 5**
Ratio 6:1 (hours)	600	2,100	2,600	3,109	3,100
Ratio 5:1 (hours)	500	1,750	2,250	2,750	2,750
Ratio 4:1 (hours)	400	1,400	1,800	2,200	2,200
Ratio 3:1 (hours)	300	1,050	1,350	1,650	1,650

Salary Range: $85,000

WAAWAA IMMERSION VIDEO PRODUCTION TIME ESTIMATIONS					
Hours of video to be produced each year	**200 Year 1**	**400 Year 2**	**400 Year 3**	**500 Year 4**	**500 Year 5**
Ratio 6:1 (hours)	1,200	2,400	2,400	3,000	3,000
Ratio 5:1 (hours)	1,000	2,000	2,000	2,500	2,500
Ratio 4:1 (hours)	800	1,600	1,600	2,000	2,000
Ratio 3:1 (hours)	600	1,200	1,200	1,500	1,500

Salary Range: $37,756 - $49,263

BILINGUAL STEM VIDEO PRODUCTION TIME ESTIMATIONS					
Hours of video to be produced each year	**50 Year 1**	**175 Year 2**	**225 Year 3**	**275 Year 4**	**275 Year 5**
Ratio 5:1 (hours)	250	875	1,125	1,375	1,375
Ratio 4:1 (hours)	200	700	900	1,100	1,100
Ratio 3:1 (hours)	150	525	675	825	825
Ratio 2:1 (hours)	100	350	450	550	550

Salary Range: $50/hour

In our pilot video production exercises various problems arose that were immediately mitigated on the spot. Our goal is to make high quality understandable immersion video. However, we need to do this within a reasonable amount of time and efficiently. We implemented some different strategies and found

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improvements in production time. We will have to closely monitor the production of video and continuously look for ways to better streamline the production. Our project based accounting software will assist us in tracking hours of production and providing us with more accurate numbers to make decisions.

Board and Committee Costs

Expenses related to the operations of our 2 committees and the Executive Board has been incorporated into the budget. Expense categories included honorarium, travel and training, in accordance to Biigtigong's policy and the scheduled meeting and/or training times.

Technology Costs

Expenses related to the administration and management of BiigtigongX, our on-line platform, including the costs of Appsembler and the database has been included in the proposal. We carefully examined the option to utilize Appsembler as our main administrator versus hiring a full time person. The decision was made to use Appsembler due to lack of qualified resources in the community and the pricing was cheaper than hiring a full time staff. Expenses for some education licenses, supplies and equipment are included.

Training

Annual training dollars has been allocated to each year. Training and capacity building at the local level is of primary importance. Building internal capacity for the purpose of long-term sustainability is always one of our ways to achieve our goals. Our training will be very specific to the needs of the projects. We will implement a training video series, which demonstrates our experience and best-practices from implementation.

Community Engagement Costs

We included a budget for the community engagement expenses. Part of these expenses includes for some meetings off reserve. Engagement activities will support the implementation of our engagement strategy, as outlined in Chapter 6.

Revenue

Biigtigong has committed $100,000 a year to support the language revitalization efforts. We have not identified any other revenue sources, other than Infrastructure Canada. We are committed to looking for additional sources of revenue, should our proposal be selected. Although revenue is not being transferred directly to the Smart Cities accounts, other organization Departments are making contributions to the project implementation. These contributions are listed further down in this chapter.

Budget and Project Milestones

Our budget was developed to facilitate the implementation of our proposal and the attainment of our outcomes. An accompanying detailed listing of milestones that will trigger payments supports the budget. The milestones are broken down according to fiscal quarters per fiscal year. Further details regarding the milestones and the specific outcomes and indicators are discussed in Chapter 2. We feel the milestones identified are measurable and achievable and provide a sound basis to determine the release of payments. We will continually monitor and evaluate our entire process and making the necessary adjustments to ensure we are meeting the goals of our project. As part of our commitment to transparency and accountability, we will keep all of our stakeholders aware of our progress in attaining our outcomes and celebrating our milestones. It is our intention to ensure our community celebrates the achievement of our milestones; these celebrations are important, especially in the beginning of new projects that are not traditional in nature.

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Cash flow and Project Milestones

We developed cash flow statements based on the budget and the project needs. Our expenditures are posted to specific periods that correspond with the actual project activities. Our revenue streams, at this time, only have two sources – Biigtigong Chief and Council ($100,000 annually) and Infrastructure Canada (1 million annually). We propose an initial $250,000 from Infrastructure Canada be released in July, another $500,000 in December and the remaining $250,000 in April. These release periods are supported by the identification of specific milestones.

Our cash flow projections indicate a few months where there is a negative net cash flow from operating activities. The negative cash flow resulting from the proposed cash release periods has been carefully examined in relation to the cash flow requirements of the entire organization. These numbers have been amalgamated into the organization's combined budget. Our Director of Finance and the Finance Committee make decisions regarding the cash needs of the organization. The negative net cash flow resulting from this project is not a problem in the bigger management of our cash flow requirements. As our milestones are identified by fiscal quarters, we are flexible in determining the actual cash release dates. However, we believe we can manage our affairs with the cash flow projections provided herein.

Monitoring and Controlling the Budget

All departments are required to regularly monitor actual activity to planned activity and control their expenditure to ensure that it is in line with available funds. If required, appropriate corrective action should be taken to resolve significant differences between actual and planned activity. Our finance policy and procedures outline the required steps to monitor and control the budget. The Program Lead will be responsible for the monitoring and controlling of the budget. Regular reporting to the SC Executive Board will ensure accountability, along with reporting to Chief and Council.

Measuring Performance and Outcomes

Budgeting supports the implementation and achievement of project outcomes and goals. Chapter 2 of our proposal outlines our approach to performance measurement. It is important that our outcomes are clearly stated and that the indictors accurately measure our outcomes. Clear communication and reporting systems between the SC Project Lead, the implementation teams and the Finance Department are important to the overall management of the program.

Community Engagement

We will adhere to the reporting requirements set out by Chief and Council and the Senior Management Team as per the policies of the First Nation. However, we are committed to enhance the level of engagement for this proposal and are implementing a new (but ancient) method of engagement – our traditional clan system. We are going to use this more intimate relationship based method to engage our membership. We will utilize this system to provide financial and performance information to our membership. Since this is a new initiative, we will be implementing systems to track, evaluate and adjust the process immediately, as part of its development process. We are trying to find creative approaches to providing our citizens the opportunities to increase their knowledge and become active players in building their families, community, Nation and the world.

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Contributions

Our approach to amplifying the impact and reach of our Smart Cities proposal is ensuring there exists alignment with the overall vision and goals of the First Nation. Our strategy is not necessarily geared at leveraging revenues but rather developing and adjusting our programs to ensure long-term sustainability of our Smart Cities projects. The five year implementation period will allow us to develop resources, capacity and systems that will be integrated into the regular programs be provide.

Annual Funding:

$100,000 is currently allocated to the language revitalization via a ten-year commitment made by Chief and Council. This funding will be directly transferred to the Smart Cities account to assist with the language efforts.

Program Support:

Departments within our organization have directed resources within their respective departments to support of the Smart Cities proposal. These resources will remain in the existing structure and management systems of the First Nation. However, they have been assigned to assist in the implementation of the Smart Cities proposal. We have a culture and the systems to support inter-departmental collaboration on shared vision, shared problems and shared approaches. These contributions amplify the impact and reach of our projects.

Department	Contribution	Purpose
Child & Family Learning Centre	1 FT Staff Position, salary and MERC	Language Revitalization
Child & Family Learning Centre	STEM based professional development for ECE teachers	STEM Implementation
Health & Social Services	Inter-generational trauma support and recovery services	Language Revitalization
Health & Social Services	Bilingual Health Promotions & Signage	Language Revitalization
Sustainable Development	Nishnaabe place-name reclamation project	Language Revitalization
Sustainable Development	Local Oral History Project	Aadsookaanan and language immersion stories
Sustainable Development	Supervision & management by the Economic Development Manager	High School reBOOT and CompTIA A+ Co-op program implementation
Sustainable Development	Summer Student Supervisor	High School summer student reBOOT and CompTIA A+ program
Sustainable Development	Summer Student Employment Positions for CompTIA A+ and reBOOT support	High School summer student reBOOT and CompTIA A+ program
Education	1 FT Staff Position, salary and MERC	Language Revitalization
Education	Education staff will be implementing the K-12 STEM and Nishnaabemwin Immersion	K-12 STEM Bilingual STEM video Nishnaabemwin Immersion
Education	Professional Development geared to support STEM, Blended Learning and Growth Mind Set	K-12 STEM Nishnaabemwin Immersion
Education	Coordination of Land-based learning activities & the Meet up program	Meet-up app Real-world connections
Education	Student program equipment & supplies	K-12 STEM
Education	Summer Student Coding Camp & Co-op Prerequisite delivery	K-12 STEM

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All Departments	CompTIA & reBOOT co-op placement and summer student employment support	K-12 STEM
Other – Related Entities		
Pic River Development Corporation	$20,000 Computer Donation to the school (possible annual donation) IT Support, cloud file transfer	K-12 STEM
Anishinabek Employment & Training	Summer Student Employment and Training Contribution - $50,000 for 3 years. Access to other services via proposal	High School summer student reBOOT and CompTIA A+ program

Report on the use of the Finalist Grant

We identified a series of priority tasks that were required in order to further develop our final proposal. The finalist grant was used to complete these tasks. The following provides a summary of these tasks.

1. **Develop an On-line Education Model:** Our team conducted extensive research on on-line education models. Based on our research and an examination of our student needs, consideration of our resources and review of our education philosophy, we determined that a Blended Learning Model was most appropriate for us. Blended learning is an approach to learning that combines face-to-face and online learning experiences. The combination of the in-person and online elements create a richer learning experience. We are not creating an on-line education model, but rather a hybrid model, that makes the best of on-line and the brick and mortar model.

   We also examined various education pedagogies relating to on-line education. We adopted the Growth Mind Set Approach, a learning theory developed by Dr. Carol Dweck. It revolves around the belief that you can improve intelligence, ability and performance, as the mindset is malleable. Unlike a fixed mindset, where the belief is that they are either 'smart' or 'dumb', the Growth Mind Set advocates that abilities can be developed.

   Additionally, we reviewed the Blended Learning approach to education and the Growth Mind Set philosophy in relation to our traditional Nishnaabe practices relating to learning. We believe that the three approaches can work collectively to provide the best learning experience for our children and families. Some initial training with our education staff was conducted and they were involved in the decision-making process regarding the approaches and methods of learning to be implemented in this project. The community was engaged in discussions and presentations on the Growth Mind Set and Blended Learning approaches to learning.

2. **Research eLearning, eAcquisition and "Meet-Up" and open-source platforms:** Based on our identified needs and the consideration to make our project scale and replicable, we selected open edX, a learning management system. Our platform to house the eLearning, eAcquisition and the Meet Up forum, will be called BiigtiongX.

3. **STEM Curriculum Development:** We employed our teaching staff and experts in the STEM field to design and develop K-12 STEM curriculum. Our current leads in our math and science programs conducted a mapping exercise, looking at how the on-line curriculum as presented by Khan Academy matches with the Ontario Provincial Curriculum. We developed a strategy on how to augment and enhance our current math and science programs with on-line resources.

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After extensive research across many sectors, consideration of needs and the availability of resources, we determined a pathway to allow us to meet our needs. We identified the skills, knowledge and abilities we wanted to develop in our students and then determined the resources that we would employ to facilitate this learning. Our technology and engineering components of our proposal will utilize a variety of on-line resources with classroom teacher support; this is laid out in chapters 1 and 2. Assessment and evaluation processes to measure student success are included in the curriculum.

4. **Reconstruction of Core Aadsookaanan:** Much of the work during the finalist stage was identifying the risks associated with putting our aadsookaanan on-line and the potential disconnect from the real world. Time with our elders and knowledge holders helped develop a model that mitigates any potential risks and embraces the possibilities of cultural revitalization of our sacred stories in this modern time. Additionally, our initial research provided evidence that their exists significant amount of primary research from the community that would facilitate legitimacy in our reconstruction work. A draft framework and work plan has been developed.

5. **Language Immersion Video Development:** Our immersion model is based on research and best practices in the creation of speakers. In addition to the research, we have been fortunate to witness this model being successful with an individual, who happens to be now working on our language revitalization plan. We spent time with potential immersion instructors providing them with the knowledge and tools to make immersion video. Our training produced three amazing WaaWaa Immersion Instructors. These immersion instructors produced a variety of videos, which were tested internally for understandability and for teaching purposes. We have a team of trained WaaWaa instructors who are ready to produce highly comprehensible immersion video.

   We also showcased 4 videos at a community night to demonstrate our immersion video. We purposely selected videos that we thought would bring laughter to our audience; we wanted a roll out that brought laughter and hope. These videos were successful in demonstrating our product. The audiences that viewed our video reported that they understood the story and it's meaning was successfully conveyed. This provided additional verification that our model will work; we still have to take a few moments to breathe, as we will be creating generations of understanders of our language, something that has not been done in centuries. It truly is empowering.

   We spent some time looking at the world of animation, specifically 2-D animation. Utilizing this option comes with a huge learning curve; however, we want to continue exploring the option and determine its feasibility.

6. **Language Audio Overdubs on STEM Material:** Our consultations with our elders and individuals knowledgeable in STEM, has provided good direction in our efforts to produce bilingual STEM video. We discussed ways to integrate STEM, our Aadsookaanan, the meanings within our language and our traditional knowledge. This video will not be immersion video. However, the material will be accessible in English to be utilized by today's students. This video will also assist in helping raise the language proficiency of community's understanders and speakers of the language.

7. **Data Collection:** Considerable time was spent determining what data was actually needed to support the measurement of our outcomes. Our education system already has a process for the

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collection, protection and distribution of student data. We will continue to protect the data of our children and have the school be the central entity for the student data.

8. **Community Education and Engagement:** Engaging the community on this initiative was a wonderful community building experience. It was exciting and everyone was engaged, a bit fearful of change but willing to embrace change for the betterment of our children. Part of meaningful engagement is providing education and facilitating a learning experience. Our community members have a basic knowledge base of things like, second language acquisition, blended learning, growth mind set, programming languages, technology and engineering. With education comes meaningful engagement and support.

   We conducted community wide and focus group surveys and lots of engagement activities. We had support during our application process but we have gained so much more than support during this phase. Our community, our staff and our leadership see the absolute importance of our proposal. We have real community buy-in; they are engaged partners.

9. **Elder and Knowledge Carrier Protocols:** We respected the cultural protocols in place for our time with our elders and knowledge carriers. Teachings were shared regarding cultural protocols regarding the transfer of knowledge and the social environment in which these may occur. Discussions occurred over the impacts, both positive and negative, of the digital world and the transfer of our cultural knowledge. A solid relationship has been built with our elders and knowledge keepers. Their involvement remains critical to the success of our project.

10. **Project Management Software and Collaboration Tools:** We utilized Slack for our collaboration work. Project management software was not looked into, as there already exists effective in-house systems of management.

11. **Training/Travel:** We conducted a training needs assessment to determine the gaps regarding the delivery of the new services being proposed. Some initial training was provided to our classroom teaching staff, along with pilot projects that implemented the teaching of technology and engineering. Training was also provided to other staff members connected to the project implementation. We conducted immersion education training for our WaaWaa instructors. On-going training will be built into the proposal in order to build the capacity at the community level to ensure long-term sustainability.

12. **Governance and Administration:** A staff member was assigned to coordinate the project. Governance and administrative systems to effectively and efficiently support the project are set up. We built upon the existing structures and policies of the First Nation while creating some innovative approaches to governance. Our clan system of governance will be used for engagement and consultation with the community. Some financial resources were spent on software, hardware and other supplies. Detailed financial analysis of the project was completed.

13. **How-to-Manuals:** Our education staff will be documenting some best practices as a result of project implementation. The staff acknowledged their fears in teaching subject matters where they had limited knowledge and skills. In response to this fear, they decided to document their journey and provide encouragement and tips for others facing similar challenges.

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Summary of Expenditures via Projects

Project	GL Accounts	Amount (Nearest $100)
On-line education model	63900-136	9,300
eLearning, eAcquisition and Meet-Up Platform	61110-136	6,500
STEM Curriculum Development How-to-manuals	61000-136 69010-136 68500-136 68200-136	29,200
Aadsookaanan Reconstruction	61110-136	5,000
WaaWaa Immersion Video	61000-136 64410-136	5,300 12,000
Audio Overdubs on STEM Material	61110-136	10,700
Nishnaabemwin	63900-136	10,200
Data Collection	63900-136	
Community education and engagement Elder and Knowledge Carrier protocols	60900-136 61900-136 62300-136 60900-136	300 20,300 3,100
Collaboration Tools	62630-136 63700-136	700 100
Travel/Training	66350-136 66620-136 66630-136 66634-136 66700-136 67300-136 67400-136 67410-136 67430-136	37,200
Governance and Administration	69010-136	40,000
Supplies & Equipment	65400-136 64030-136 65450-136	2,500 3,300 900
Coordination & Development	61000-136 69010-136	20,000
Proposal	61000 -136	10,000
Sub-total		226,600
Administration Fee	8%	20,000
Total		246,600

Financial Risks and Mitigation Strategies

Our approach to risk management is identified in Chapter 3. Risk management is an on-going task and is not something that happens at a particular time in the project's lifecycle. We have carefully examined a comprehensive list of risks throughout the development of this proposal. We have successfully mitigated and/or avoided some potentially significant risks. In our belief, this has led to a much better and more realistically implementable project. We continue to be aware of the likelihood and potential impacts of the risks in front of us. We will respond accordingly.

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The biggest risk of all is the loss of Nishnaabemwin – not only from the hearts and spirit of our children, our families, our communities and Nations, but from the world. Once the Nishnaabe language is lost from here, it is lost forever. Immersion is the mitigating action towards the loss of Nishnaabemwin in Biigtigong. We have done considerable research in how to create speakers and immersion is our answer. We have also been fortunate to witness first hand the results of this method. We saw a young man, who was adopted out and never raised in his community, with his family, with his people, with his culture, his language, find his way home – researched and taught a first speaker how to pass on her language and today he is a fluent speaker of Nishnaabemwin. This is the method that we will use to make our video. It's amazing to think that our language can once again be passed on in our homes, our schools – actually, pretty much anywhere. It's just going to be done in another way because of the emergency state of our language.

Financial Risks and Mitigation Strategies			
Risk	**Likelihood**	**Impact**	**Risk Management Approach/Mitigating Actions**
Cost to make WaaWaa Immersion Video is too high	Medium	High	• Provide on-going training • On-going Immersion Instructor Recruitment • Establish work flow procedures and accountabilities • Set up a review & monitoring system • Establish best-practices • Provide stories and video content ideas • Provide employee support and encouragement
Nishnaabemwin audio overdub cost is too high	Medium	High	• Audio-video editing software & related training • Establish work flow procedures and accountabilities • Set up a review & monitoring system • Establish best-practices • Consider use of a first speaker as a consultant • Research animation and other technological options • Focus priorities and on core competencies
Extreme high cost of uploading and downloading video	High	High	• ISP (PRDC) is providing free on-site services to assist in the offloading, downloading and uploading of video
Expensive video backup system; cloud service unreliable for now	Medium	High	• Develop safe and reasonably costed manual backup system • ISP (PRDC) is setting up a free back up system on their servers
Loss of $100,000 financial contribution from Chief & Council	Low	Medium	• Examine projects and make adjustments (cuts) where necessary • Ensure efficiency and effectiveness of projects • Provide and show value for the $100,000 donation – produce results • Apply for other funding and financial contributions
Project variances – deficits/cost-over runs	Low	High	• Good financial planning (strategy, budgets, short and long term) • Measurable outcomes • Regular monitoring and reporting and adjustments • Follow Biigtigong's Finance Policy and Procedures (everything is addressed in detail) • Executive Board involvement
Delay on completion milestones dates	Low	Medium	• Good planning – measurable and attainable • Utilize project function options on accounting software • Sound management and supervision processes • Implement on-going evaluation and corrective measures process • Communication – Executive Board, Director of Finance
Cash Flow challenges	Low	Medium	• Good planning – measurable outcomes, milestones and results • Good management and supervision processes to meet outcomes • Provide accurate and timely information to Director of Finance • Ensure reporting requirements are followed • Follow Biigtigong's Finance Policies and Procedures
Partnerships are costly	Low	High	• Build internal capacity and take on responsibility at the community level • No long-term financial dependency on partners • Financially creative – no duplicate of services, efficiencies, mutually beneficial

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			• Develop detailed agreements, if necessary
Low Student Participation	Medium	Medium	• Program is designed to be interactive and hands on approach • Meaningful outcomes • Onboarding and recruiting strategies • Incentives – i.e. Summer Student Employment • Community celebrations • Good co-op placements • Offer program neighboring First Nation • Develop on-line resources for scalable and replicable
Miscommunication between departments that are working on projects.	Low	Medium	• Written communication and protocols • Utilize real time collaboration tools • Regular meetings – with set agendas • Dispute resolution process • Clear roles and responsibilities
Inaccurate or incomplete project results due to the failure to identify and/or document specific project activities.	Low	Medium	• Clear performance measurements to be set • Determine indicators and measurement tools • Set deadlines and standards • Set up deadlines and activities inside of accounting software • Reporting standards • Performance standards for employees
Uneven workflow issues that decrease employee productivity	Low	High	• Accurate and thorough job analysis process • On-going monitoring and evaluation • Utilize iterative management approaches • Develop good relationships – open communication • Promote organizational culture

Operating Budgets and Cashflows

The five (5) Year Operating Budget and five (5) Year Cashflows are presented on the subsequent pages.

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Chapter 9: Implementation Phase Requirements

Introduction

Biigtigong Nishnaabeg is committed to meeting the applicable municipal, provincial and federal reporting and legislative and policy requirements should we be selected as a winner.

Duty to Consult with Indigenous Groups

Biigtigong is a First Nation community and therefor the Duty to consult with indigenous groups does not apply. However, with that being said, we want to acknowledge that Biigtigong Nishnaabeg has policy regarding Duty to consult. This document outlines how Biigtigong Nishnaabeg expects to be approached regarding activities within their traditional territory. This guideline establishes Biigtigong's expectations, policies and practices for governments and others to follow when consulting with them. Our Smart Cities Team reviewed this policy as we were developing our engagement strategy with the community. We wanted to build upon best practices established in the community and develop a solid engagement strategy.

Modern Treaty Obligations

With the exception of six First Nations, Biigtigong being one, the area First Nations are signatories to the Robinson-Superior Treaty of 1850. There are no modern treaties in the Biigtigong Nishnaabeg traditional territory or shared territory with surrounding First Nations.

Canada's Community Employment Benefit (CEB)

Projects supported by the Investing in Canada Infrastructure Program provide an opportunity to promote increased employment opportunities for a broader array of Canadians. The Smart Cities Challenge requires the finalist to identify employment and/or procurement opportunities for at least three of the targeted groups and how Biigtigong intends to report upon CEB requirements, should we become a winner.

To meet these requirements Biigtigong has selected the following 3 target groups: Indigenous peoples, woman and youth. The main beneficiary of our Smart Cities proposal is Canada's Indigenous youth. Our projects are specifically aimed at this group with the ultimate goal of making them more educated and more employable. We will include woman as a specific category that we will also target. We will ensure our indicators for success specifically capture data on these 3 identified groups, in terms of their participation in our projects. We anticipate that 90% of our participants will come from one of these groups.

Additionally, we will utilize our procurement strategies and direct our hiring towards these 3 groups. We expect that at least 80% of our work force for this project will be Indigenous, a youth or a woman. It will be very easy to meet these targets and to track the relevant supporting data.

Reporting on the CEB Requirements

As per the CEB requirements, we will report annually on the progress made. Should we be selected as a winner, we will develop a detailed strategy that also defines our reporting requirements. CEB requires some specific information and we will accommodate this requirement. For example, we need to track the number of hours worked by the target population and/or the value of contracts awarded to the target groups. Our accounting software allows us to easily track this information.

A qualitative narrative that describes the progress made is also required. The narrative will provide information on both the successes and challenges experienced in meeting our targets. We understand

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that this information will help in developing Canada's strategies to offer more diversified employment and procurement opportunities.

We will develop specific reporting mechanisms to support any requirements or conditions of being a selected a winner. We have experience establishing targets, monitoring progress and being flexible to respond to isses.

Risks and Mitigating Strategies

Risk	Likelihood	Impact	Mitigating Strategies
Woman at home with no child care	Medium	Medium	• Provide childcare support at the daycare • Work with other supports in the community
Work readiness levels are low amongst participants	Medium	Medium	• Community programs exist that provide assistance in this area – use these • Long-term strategies
Youth experiencing social and emotional issues	High	High	• Social Service support programs • Cultural support programs • Life skills component built in • Use of elders in the programs • Utilizing land-based learning program
Lack of parent support	Low	Medium	• Provide information and education to the parent • Offer home-visits • Engaging and non-judgmental approaches • Utilize existing relationships
Lack of formal education and skill set to do some specific tasks	High	Low	• In the short-term we will have to recruit from outside the population • Develop long-term capacity development to attain education and experience
Current procurement policy may not support goals	Low	Low	• Review policy & recommend changes • Conduct education on updated policy
Political leadership lack of understanding of the project procurement goals	Low	Medium	• Address in person at a council meeting • Provide research and education • Regular reporting and communication
Lack of financial resources to implement training programs	Low	High	• Council has already made a commitment to direct some resources to summer employment • Develop funding proposals
Data security and protection of personal information	Low	High	• Data and Privacy Policy • PIA completion • Communications & education • Disclosure and Transparency strategy

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Biigtigong Nishnaabeg
(Pic River First Nation)

Smart Cities Challenge

Final Proposal Submission

Submitted by:
The Biigtigong Nishnaabeg Smart Cities Team

On:
March 5, 2019

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Executive Summary

Canada is trying to create a smart technology future. Biigtigong Nishnaabeg First Nation is trying to revitalize their indigenous language and culture while preparing their K-12 students for the smart technology future.

By utilizing open source software and results-oriented approaches to facilitate effective online learning, effective online acquisition of their endangered Nishnaabe language, and revitalization of their culture - all as an enhancement to their brick-and-mortar K-12 curriculum delivery model, Biigtigong Nishnaabeg are transforming their youth into better-educated, more employable, better-grounded, and more holistically Nishnaabe people.

The graduates of their K-12 curriculum will be able to nearly-completely understand their Nishnaabe language (which is a first-step on the way to becoming a speaker of *any* human language), will have been educated on the interface of the their Nishnaabe worldview with the STEM subject perspectives, will have had increased involvement in real-world traditional Nishnaabe activities in the territory of the Biigtigong Nishnaabeg, will have experienced increased relationship-building with all community members especially in the context of those traditional activities, will be able to code, to build and control robots, and will have been educated in the entire exam preparation curriculum of a general-accepted best-starting point certification to enter the IT working world.

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Chapter 1: Vision

Challenge Statement Vision

Our Challenge Statement reads:

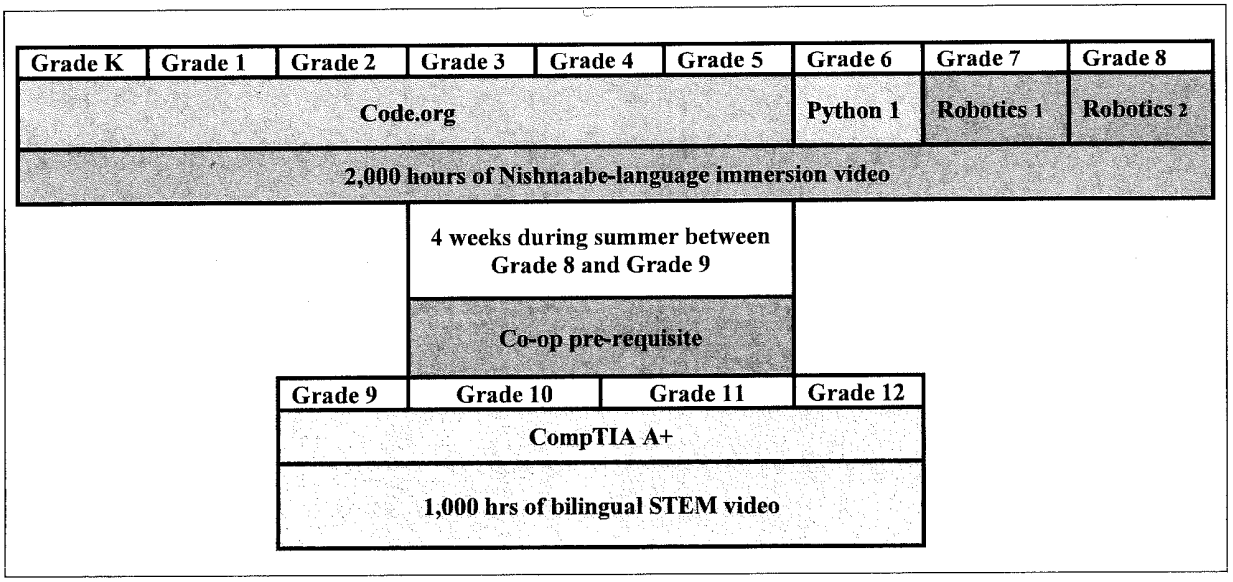
> *By means of active, cross-generational, technology-empowered, real-world participation in the intergenerational transfer of traditional Nishnaabe knowledge through the medium of our language, and the bilingual delivery of modern K-12 STEM knowledge, our community will transform our youth into better-educated, more-employable, better-grounded, and more holistically Nishnaabe people.*

Please see Figure 1-1 for a graphical representation of the "bilingual delivery of modern K-12 STEM knowledge" which we propose in our Challenge Statement.

Outcomes Produced by Carrying Out Our Vision

Our final proposal will carry out the vision of our Challenge Statement and will produce the outcomes laid out in our application.

Figure 1-1: Our bilingual delivery of modern K-12 STEM knowledge. These proposed augmentations to our current K-12 curriculum are partially rolled-out during implementation year 1*, and fully rolled-out at the start of implementation year 2.



** For a rollout schedule of each year of implementation, please see Appendix B.*

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Our final proposal seeks to achieve the four outcomes listed in our Challenge Statement:

(1) **youth who are "better-educated"** due to
   a. their having successfully completed a greater number of K-12 STEM subjects post-proposal implementation than they successfully completed pre-proposal implementation; and
   b. their increased preparedness for college and university as a result of their having successfully completed a greater number of K-12 STEM subjects post-proposal implementation than they successfully completed pre-proposal implementation;

This outcome is measurable via these progress indicators:
- Increase in number of K-12 STEM courses successfully completed by K-12 students, beyond what is currently offered in our K-12 curriculum
- Decrease in percentage of K-12 students needing remedial help in STEM subject areas

(2) **youth who are "more-employable"** in current jobs, as well as in yet-to-be-known types of STEM-related jobs, which require knowledge / expertise in the K-12 STEM subject areas;

This outcome is measurable via these progress indicators:
- Increase in number of K-12 STEM courses successfully completed by K-12 students, beyond what is currently offered in our K-12 curriculum
- Increase in number of K-12 students who have at least a basic ability to code

(3) **youth who are "better-grounded" in their Nishnaabe identity** due to
   a. their knowledge of our core aadsookaanan; and
   b. their increased participation in our community's traditional Nishnaabe activities;

This outcome is measurable via these progress indicators:
- Increase in number of K-12 students who know the key concepts expressed in each of our core aadsookaanan
- Increase in number of traditional Nishnaabe activities in which each K-12 student, on average, participates per year

(4) **youth who are "more holistically Nishnaabe"** due to
   a. their ability to nearly-completely understand our spoken Nishnaabe language; and
   b. their increased participation in our community's traditional Nishnaabe activities; and
   c. their knowledge of the roles of our Nishnaabe worldview in modern technological society

This outcome is measurable via these progress indicators:
- Number of hours of Nishnaabe language acquired by graduating eighth-graders is at least 2,000 hours
- Increase in number of traditional Nishnaabe activities in which each K-12 student, on average, participates per year
- Number of hours of Nishnaabe-language STEM video successfully completed by graduating high school seniors is at least 1,000 hours

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The way in which our final proposal carries out the vision of the Challenge Statement, achieving our four outcomes, is via the following six activities/projects:

(1) **"active participation"**

We mean active in contrast to passive, where active participation includes engaged Khan Academy-style Growth Mindset blended learning pedagogical approaches – approaches which take into account the recent discoveries on how humans beings more effectively learn knowledge in online and hybrid (online and brick-and-mortar, combined) environments; calls to real-world action on our online, mobile-enabled platform (particularly on the eLearning, eAcquisition, and meetup forum functionalities of the platform), online forums, and online community discussions; real-world, hands-on activities undertaken and completed in a group setting, our youth wrapped in the embrace of the community network; strong encouragement to attend community events, with those community events effectively and articulately made known to all community members via our online forums and discussions.

This activity/project achieves the following outcomes:

- **youth who are "more holistically Nishnaabe."** Community-engagement is a foundational component of our Nishnaabe way of living. Actively participating, not just in social activities – which are, indeed, foundationally important to community vibrancy and individual flourishing – but also being actively engaged in our own learning – both formal and informal – is a key to success in whatever role a Nishnaabe individual plays in the community. Actively participating in the whole of the Nishnaabe community is an imperatively important requisite for one's wellness as a Nishnaabe person.
- **youth who are "better-grounded" in their Nishnaabe identity.** Our Nishnaabe people cannot be only *knowledgeable* of our social norms and ways of being. This knowledge must be *implemented* in one's life in order for one to be a whole Nishnaabe person. Similarly, much knowledge can be obtained through the very act of active participation in one's community. Knowledge and active participation are thus connected. Active participation leads to knowledge. Knowledge, in turn, leads to active participation. In order for a Nishnaabe person, then, to be more knowledgeable – better-grounded – in being Nishnaabe, active participation in the Nishnaabe community is required.

(2) **"cross-generational participation"**

Cross-generational participation means not just youth/students, but community members from the entire span of ages, from all generations.

This activity/project achieves the following outcomes:

- **youth who are "more holistically Nishnaabe."** Similar to the reasons given in the above section on the active participation requisite for one's being holistically Nishnaabe, all sectors of our Nishnaabe community must have a space and a place to participate. Each age group brings a diverse set of experiences, gifts, and knowledge to our collective Nishnaabe community, and to the overall wholeness of each of the individuals within the community. The participation of everyone, from all generations, is required for each of us to be holistically Nishnaabe.
- **youth who are "better-grounded" in their Nishnaabe identity.** We Nishnaabe people believe that everyone – no matter one's age – is a teacher and a contributor to the collective's knowledgebase. Encouraging and ensuring the participation of all generations

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provides a maximally diverse dataset of experience as knowledge, made available to and learnable by each and every Nishnaabe community member who participates in community events. This cross-generational participation leads thusly to better-grounded Nishnaabe community members.

(3) **"technology-empowered participation"**

Technology-empowered participation refers to engagement with the eLearning and eAcquisition functionalities of the Open edX platform; engagement in Open edX's meetup discussion forums for traditional Nishnaabe activities; online platform discoverability of friends'/relatives' locations and currently-happening traditional activities in order to encourage students to, in like manner, take part in those made-discoverable activities.

This activity/project achieves the following outcomes:

- **youth who are "better-educated."** Knowing not just about technology, but being – and being comfortable – in a technology-oriented mindset, versed in the social expectations and norms of this modern way of interacting with our technological world is prerequisite knowledge and an imperatively important education to have. Just being able to navigate this brave new world of technology is a plus on one's curriculum vitae, and our proposal's implementation will yield for our Nishnaabe youth exactly that: a better education through the experience of successfully participating in this new technology as a means to better one's self educationally.
- **youth who are "more employable."** The technology-empowered participatory tools – the rules of online community engagement – that will benefit our Nishnaabe youth are, in many cases, the precise job skills required to even be considered for a job interview. Online forum etiquette, respecting boundaries of online relationships, being responsive to and responsible for timely replies to online community engagement requests and relationships, and a host of other modern technological communication social norms – the very skills and education that our proposal will instill in our Nishnaabe youth – are what will help prepare our Nishnaabe youth to be effectively and productively employed in today's – and the future's – job market.

(4) **"real-world participation"**

Smart technology is an enabling factor, a factor which enables real-world participation – not just online participation, but participation in the real, material world. The world of touchable human beings, hugs, babies, tears, family, and love. Our proposal intends to implement this technology to facilitate and encourage participation in real-world community events.

This activity/project achieves the following outcomes:

- **youth who are "more holistically Nishnaabe."** Being Nishnaabe means being community-oriented. Participating and being an active, contributing part of the lives of those whom we are networked within our territory is a requirement of our communal approach to effective and productive existence on this earth. Participating in the real world, the material world, of our Nishnaabe community is thus a requirement of being a whole Nishnaabe.
- **youth who are "better-grounded" in their Nishnaabe identity.** Being better grounded means being better educated. And being better educated happens, in part, by being around

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the educated and knowledgeable ones. For Nishnaabe people, all activities are a teaching opportunity – and thus a learning opportunity. Being out and about in the community leads naturally to discussions with people more knowledgeable than us, which in turn leads to becoming more knowledgeable ourselves – more educated, and thus better grounded.

(5) **"intergenerational transfer of traditional Nishnaabe knowledge through the medium of our language"**

Our proposal aims to produce 2,000 hours of Nishnaabe-language immersion video, the content of which will be our core aadsookaanan (our sacred stories, our philosophical foundations, the building blocks of our worldview). Our aadsookaanan are, in part, the imperatively important intergenerational knowledge which has been passed on – in story form – for countless generations. The acquisition – language *acquisition* (subconscious) in contrast to language *learning* (cognitive) – of 2,000 hours of a target language yields an individual who can nearly-completely comprehend that target language. The target language in this case is our Nishnaabe language, and it is with this 2,000 hours of immersion video of our aadsookaanan that we intend to create understanders of our Nishnaabe language – understanders who can then go on to successfully complete 1,000 hours of STEM subject non-immersion video (i.e., what we usually refer to in this proposal as 'bilingual STEM video'), the audio of which is delivered in our Nishnaabe language.

This activity/project achieves the following outcomes:

- **youth who are "more holistically Nishnaabe."** Being a whole Nishnaabe requires that one be a speaker of one's Nishnaabe language. While this proposal is not big enough to facilitate that particular outcome, becoming an understander of our Nishnaabe language is, indeed, attainable within the timeframe of this proposal. And, since we are aiming for "more" holistically Nishnaabe, becoming an understander of our Nishnaabe language fits the bill quite nicely. Two points here: (1) being able to understand one's indigenous/heritage language, for a member of any culture, seems obviously contributory to one's being more holistically of that culture and identity; and (2) walking around in the world with a headful of knowledge that got into one's head via a foreign language does not make for a very "holistically Nishnaabe" person. While knowledge and education are important in their own right, it is more holistic for that knowledge and education to have entered one's head in the medium of one's own indigenous/heritage language. So, our youth being able to understand our Nishnaabe language which in turn makes possible their learning content of a modern K-12 STEM curriculum delivered in the medium of our Nishnaabe language is a powerful contributor to their becoming more holistically Nishnaabe.
- **youth who are "better-grounded" in their Nishnaabe identity.** Knowing about one's cultural identity is self-evidently important to one's wholeness. But, knowing the main tenets of the core philosophies of one's culture is absolutely key to one's being well versed in the oral/written stories/literature of one's culture – especially when one considers the importance of learning this information through the medium of one's language. Learning the main ideas expressed in our Nishnaabe aadsookaanan, through the medium of our Nishnaabe language, produces Nishnaabe youth who are more knowledgeable of, thus better-grounded in, their Nishnaabe identity.

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(6) "bilingual delivery of modern K-12 STEM knowledge"

This activity/project refers to the combination of our English-language K-12 STEM curriculum and the 1,000 hours of bilingual (Nishnaabe-language and English-language) STEM video. Please see Figure 1-1 for a graphical representation of this post-augmented curriculum. Our bilingual STEM video will, in part, teach our grade 9-12 students about the role of our Nishnaabe worldview in modern technological society. In particular, our bilingual STEM video will show that there is no conflict in the explanations provided by modern-day STEM and our Nishnaabe worldview. More specifically, our bilingual STEM video will enlighten our students about the relationship between the teachings of our aadsookaanan (which we can refer to with more culturally-neutral terminology as 'allegorical narrative,' or simply 'mythology') and STEM: the role of science is to explain/show/teach what *is*; the role of mythology is to explain/show/teach *why* (metaphysically why) something is.

For example, the scientific explanation of lightning and thunder (that lightning is a huge electrical discharge that flows between clouds, from a cloud to air, or from a cloud to the ground; and that thunder is in turn caused by lightning), and our Nishnaabe worldview explanation of this same phenomenon (that thunder beings are engaged in an eternal battle with the great underwater lynx; an allegory for the eternal battle between good and bad). Only in modern times have these two traditions (i.e., mythology and science) been viewed by some as 'in conflict,' or 'in competition.' Historically, however, throughout the world's indigenous societies, at least, mythology has made science more culturally fitting – not tried to compete with, nor replace the role of, science.

Mythology has *not*, historically, tried to do the work of the STEM fields. Mythology and STEM have, historically, been partners in explaining the world around us in a culturally-appropriate – and usually quite poetic – manner. In similar fashion, this is the function of our bilingual STEM video, and the role of our bilingual delivery of modern K-12 STEM knowledge, in general: to explain the scientific, material world around us in a culturally-appropriate - and usually poetic – manner. This activity/project achieves the following outcomes:

- **youth who are "better-educated."** The need of this generation of K-12 students for a solid STEM subject area education is undeniable. One need only browse the course descriptions or syllabi of almost any college/university curriculum to find the very long list of requisite technology, math, science, programming knowledge for those majors and academic program paths. Providing our youth with thirteen years of a modern, K-12 STEM curriculum will provide them with the tools, knowledge, and mindset to succeed in the increasingly demanding curriculum of this modern technologically-driven world.
- **youth who are "more employable."** For reasons similar to the ones given in the above paragraph, our youth who have successfully completed our bilingual, modern K-12 STEM curriculum will not only be better prepared for college and university. The college and university curriculums are being designed, in part, to produce graduates who are more employable in this technologically-driven world and job market. Our youth, having completed such solid preparation as provided for them by our K-12 STEM curriculum, will thus be more employable. And, not only after college/university; but, also in the high-school graduate job market, as well.

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- **youth who are "more holistically Nishnaabe."** One's having been educated in a particular subject area is an accomplishment on its own. Having been educated in a particular subject area in the medium of one's indigenous/heritage language, with that education couched in the worldview and perspective of one's mythology and culture, is an even greater accomplishment; and, an accomplishment contributing greatly to one's wholeness as a member of that language community.

The achievement of our six activities/projects, and their consequent four outcomes, are enabled by the creation of an online, mobile-enabled platform able to carry out the following three functions. We have chosen the Open edX platform for this purpose. (While we originally envisioned having three separate platforms/applications for each of the three functions, we have, during the finalist phase, opted to wrap all three of these functions into one 'Learning Management System' (LMS) platform, namely Open edX.) Open edX is open source software and facilitates the production of materials to be made available under a Creative Commons license. The three functions being fulfilled by the Open edX platform are:

(1) **eLearning.** Mobile-enabled eLearning functionality is built into Open edX with open source technologies and languages, enabling interoperable, scalable, and replicable results by any other community or organization choosing to implement a similar platform. eLearning functionality will facilitate the collection of real-time data on all aspects of community-based, online, collaborative learning, and the storage of that data in an open source database backend enabling other departments and organizations within our Biigtigong Nishnaabeg community to seamlessy access and utilize this data.

(2) **eAcquistion.** Mobile-enabled eAcquisition functionality will be nearly identical to our eLearning functionality, but will have the added responsibility of enabling the effective acquisition of our Nishnaabe language. As our community makes a strong distinction between language *learning* (a conscious, cognitive process) and language *acquisition* (which occurs subconsciously), we need to keep these two functionalities independent of each other so that each one's unique pedagogical approach can be implemented effectively.

(3) **meetup forum.** Mobile-enabled meetup forum functionality will serve as the central 'online gathering' place which will facilitate the bridging and interfacing of the digital world with the material, real world. All community members will have access to each other via this online gathering place. This functionality within Open edX is where our youth who are hoping to attend a particular traditional Nishnaabe activity can express their interest to do so. Other community members then have the ability to invite our youth along to that event. Likewise, community members who are planning an activity can now express their intentions in the meetup forum functionality of Open edX thereby providing additional options for our youth to take part in while remaining in the embrace of the real-world community network.

Data: Outcomes are Reflective of True Needs of Community

Our outcomes are reflective of the community needs. We conducted extensive community engagement sessions throughout the development stage of our proposal. These sessions were aimed at specific stakeholders and the community at large, including our off-reserve members. Through presentations, discussions, surveys, small group meetings, family meetings, luncheons, social events, we successfully engaged a large number of our community. 221 unique members attended at least one of our engagement sessions and 121 individuals completed our extensive community survey. Chapter 6 provides the findings from our engagement sessions and how community input improved our proposal.

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Outcomes are Ambitious and Achievable

Firstly, there exist extremely high unemployment rates for our youth, independent of industry. When we consider only the STEM fields, these unemployment rates for our youth are absurdly high. Our proposal will help to alleviate this.

Secondly, this proposal will move Nishnaabe people from being mainly passive consumers of technology to being active, effective STEM-educated administrators, managers, and users of data and connected technology who are able to achieve meaningful outcomes for themselves, their community, and other communities.

Thirdly, our outcomes are ambitious because we, similar to other Nishnaabe/indigenous communities, have only one high-proficiency first-speaker of our dialect. A survivor of the Canadian Indian residential school system, she is 82 years old. We have only another two medium proficiency first-speakers of our dialect. They are both in their 70s. When they leave, so will our dialect.

So, over the last five years, we have been hurriedly working with a high-proficiency second-language speaker of a related dialect. He has spent the last five years working with our elders to reconstruct our dialect. (Our Biigtigong dialect's noun declension charts, verb conjugation charts, and dictionary are all currently available on our language website, biigtigong.com, under a Creative Commons license). He is now able to 'grammar bridge' into our Biigtigong dialect from the dialect which he originally acquired; he is thus able to speak and write in our Biigtigong dialect. It is his Nishnaabe-language audio which will be heard on all 3,000 hours of video which our proposal aims to produce.

It is important for us to note here that the method which he used to become a speaker of the Nishnaabe language – he began acquiring the Nishnaabe language almost 20 years ago when he was in his 30s – is the very method of second language acquisition that we're using in our proposal to transform our Biigtigong youth into understanders of our dialect.

Whether we consider the Royal Commission on Aboriginal Peoples, the work of the Truth and Reconciliation Commission, the United Nations Declaration on the Rights of Indigenous Peoples, or that the United Nations General Assembly has declared 2019 the International Year of Indigenous Languages (IYIL2019), we have before us – "us" being Canada and we Biigtigong Nishnaabeg – an ambitious *opportunity*, indeed. An opportunity to move forward. Together. As partners. Collaboratively, we can produce the means by which Nishnaabe people can *forever* be able to become understanders (on their way to becoming speakers) of the Nishnaabe language. That's pretty ambitious.

Our outcomes are achievable because a community such as ours, Biigtigong Nishnaabeg, who has for many, many generations been healing, repairing, reconstructing, and unendingly facilitating the education and holistic Nishnaabe being of each and every one of our community members, as a collective unit, as a community, is quite the solid foundation on which to implement this proposal. The outcomes sought by this proposal are quite achievable, indeed.

Outcomes are Meaningful for the Community and Residents

Our proposal has been met with overwhelming support from our community since the very start of our Smart Cities journey. Biigtigong Nishnaabeg has been working on the revitalization of our language and aadsookaanan many years before we started work on this Smart Cities Challenge. Our Smart Cities final proposal further facilitates profoundly meaningful goals of the community which were set in motion decades ago.

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Our chief, Duncan Michano, has, for many years, shared with a great number of people his vision of educating our youth in the ways of physics, engineering, quantum mechanics, computer science, and coding. There has been a marked increase in the community's excitement around these conversations in the last four or five years in particular. Especially for our young Nishnaabe people. (For example, we already have elementary school-age kids in our community who have gone off to earn a certificate in LEGO Robotics and Programming offered by the Digital Media Academy at University of Toronto.)
Our children and youth have always been the center of our Nishnaabe society. They are, in a very real way, our future. They carry our entire ancient past, and our ongoing present, into the unknown, the future. It is difficult for our community to imagine something *more* meaningful than the betterment of our youth in this modern technological society while helping them to carry with them, as they move forward into the future, our Nishnaabe language and our Nishnaabe worldview.
The outcomes of our final proposal are, *indeed*, meaningful for our community and our residents.

Our Proposal is Well-Suited to a Smart Cities Approach
Our proposal is very well-suited to a smart cities approach.

Smart Cities Approach Principle: Openness
By making our language accessible for the first time through an online platform that can be accessible by anyone at anytime. We will also provide a model for integrating immersion education and STEM education into a standard curriculum. K-12 STEM learning can augment immersion-based cultural learning and immersion-based cultural learning can augment K-12 STEM learning.

By preserving as *open* data, a subset of our language in a certain format (i.e., in the format of *understandable* language which is able to produce understanders of our language after 2,000 hours of viewing), we not only facilitate the survival and thriving of our language into the future, we are also providing a model for other First Nation communities – as well as other communities and groups – to do the same. This initiative will strengthen the relationship between residents and government and public organizations and will help to fulfill Canada's goal of reconciliation with First Nation communities.

Smart Cities Approach Principle: Integration
Currently, our language and aadsookaanan are at risk of being lost. Through the use of connected technology, and by recording this data – including much of our raw cultural data being preserved/made-available on Open edX – we are ensuring that our community knowledge is maintained for our Biigtigong Nishnaabeg generations to come, for the benefit of Canadians, and for the benefit of the world. By this democratization of cultural knowledge, we are thus breaking down silos that exist even in our traditional societal structures. Similarly, modern-day administrative and learning management roles of K-12 teachers, of parents, of elders, and of governmental leadership, are also all further facilitated by the increase in frictionless availability of data made possible via the removal of data silos.

Smart Cities Approach Principle: Transferability
We have provided an open source, standardised, and transparent approach to integrating immersion-based cultural education and STEM education into any school curriculum - all of the videos we are producing can be overdubbed in any other language. The approach to building community capacity, through embracing language, culture and STEM can be replicated across the country regardless of a community's size or resources.

This approach is not limited to one language only. The language in question could also be Cree, Mohawk, French, or Italian, for example. There may be a need across the board - in perhaps most, or even all,

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cultures - to augment STEM learning with language-based cultural education; a need to combine, merge, and interface the digital connections with physical community. In our approach in this proposal, the meetup facilitation functionality of Open edX achieves this. Our proposal moves us into the future by embracing and continuing to facilitate the merging of the digital-world and the real-world in order to create a *truly* smart city that uses data, digital connection, and an online platform to enable intergenerational transfer of knowledge – both traditional language and STEM knowledge and education – education to create better-educated, more employable, better-grounded, and more holistically Nishnaabe(in our case) people.

Our approach is suitable for communities of any size, any location, any level of resources, and is easily replicable and scalable. We see our proposal as an ideal 'onboarding' approach for any community – almost regardless of access to technology-trained staff – to a more STEM-infused culturally-based/appropriate/infused community. Implementing the bleeding-edge STEM technologies – as a first step - is not, in our opinion, viable for many communities.

The approach we are taking – and advocating for – in our final proposal is not unlike the strategy of early-years Netflix as that company disrupted the DVD-rental industry. Netflix's secret weapon in their successful venture? The post office! Not the most modern of 'technology,' to say the least. While Netflix, of course, employed a host of other approaches and tactics, beyond its utilization of the post office, the company's achieved outcomes are still remarkable given the common 'technology' they employed. We view our smart cities final proposal in a similar light. We have deliberately chosen to deliver *bleeding-edge, four-star quality* outcomes by utilizing *common* smart technology, instead of delivering *common* outcomes by utilizing *bleeding-edge, four-star quality* smart technology. We believe that this approach will maximize the replicability of our approach - and the spread of smart technology - across Canada.

Our proposal is an onboarding approach to smart cities. Not every community has the resources, staff, equipment, Wi-Fi access, etc. to implement cutting-edge smart technology. There is a need to build STEM *knowledge* first, through the method developed in our proposal. What good are sensors and data collection if we do not have the knowledge and appropriate cultural lenses to extrapolate meaning from them? Creating a digitally-literate population is, in our opinion, absolutely essential to ensuring long-lasting smart cities - not just a fad technology that is used for a short period of time.

Lasting and impactful community change, through STEM education, and reconnection with culture through language, along with the use of common, newbie-friendly smart technology is of key importance in the overall strategy of facilitating transferability. Our approach to integrating STEM education into a K-12 curriculum is, indeed, transferable; it can be implemented in any school across the country.

Smart Cities Approach Principle: Collaboration

This technology will enable cross-generational and cross-cultural collaboration as we build a future of digitally-literate and more culturally whole youth who will lead the smart cities of tomorrow across Canada.

Progress During Finalist Phase

Progress toward our outcomes has already been achieved during the finalist phase. We:

- organized and facilitated community consultation events, each with a particular community sector focus
- implemented some changes in organization structure: established teams, roles and responsibilities, etc.

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- begun several pilot projects: story writing; aadsookaanan reconstruction; and Waawaa video production
- utilized community surveys to determine several baselines
- set up a framework for data collection and baseline measurement of progress
- produced prototypes of immersion video overdubbed with audio of Biigtigong's dialect
- developed some tools to assess staff training needs
- researched approaches to and formalized a framework for the reconstruction of our aadsookaanan
- successfully piloted Makey Makey, Scratch, and Code.org at our elementary school
- formalized our partnerships
- continue our community engagement sessions with our off-reserve and on-reserve members
- pilot with our elementary school staff and students a sampling of online classes
- further develop the interfacing of our Nishnaabe approach to learning and the Growth Mindset Approach
- continue 'Waawaa' immersion video production, evaluation, and instructor professional development

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Chapter 2: Performance Measurements

Strategy

An outcome-based performance approach is a results-based management tool that can be used to guide the selection, development and ongoing use of performance measures. For this project, this strategy will be adopted, which will enable the project team to continuously monitor and assess the results of programs as well as make informed decisions and take appropriate mitigation actions should they be required. A success outcome-based performance measurement strategy will also provide effective and relevant departmental reporting on the program and ensure that credible and reliable performance data is being collected to effectively support evaluation.

Approach

The key to achieving the desired outcomes of this project is to set clearly defined goals which are achievable for the timeline of this project. This will involve defining metrics that can be set to clearly measure the project's success, as well as to identifying any deviations which can then be quickly remedied. The metrics to be used for this project will follow the SMART methodology for goal setting, as defined below:

1. The set outcomes of this project are ***Specific***
   The desired outcomes for this project are clear, well defined and based upon the specific requirements for the completion of this project.

2. The set outcomes of this project are ***Measurable***
   Metrics have been developed to measure the progress of this project. The project team will use these metrics to assess levels of project completion and identify any deviations.

3. The set outcomes of this project are ***Achievable***
   The set outcomes of this project were developed by assessing and interpreting relevant data and by receiving input from various experts in relevant fields.

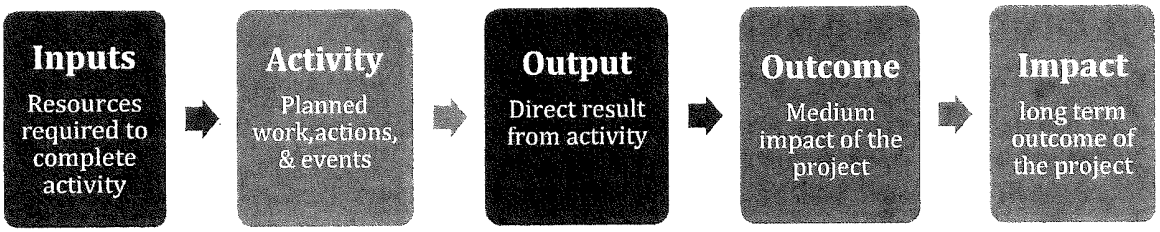
4. The set outcomes of this project are ***Relevant***
   The defined outcomes of this project are essential for the overall success of the project and were developed by pinpointing the specific needs of the project and by having discussions and input from stakeholders.

5. The set outcomes of this project are ***Time-Bound***
   The outcomes of the project have set target dates for completion based upon required inputs, activities and outputs.

Logic Model for Performance Measurement

A basic logic model will also be used to understand the process of measuring each metrics' impact throughout the project. As shown below performance measures can be depicted linearly, however, it is important to note that for each input and relative activity there will be short, medium and long-term results.

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As part of developing our measurement approach, the project team completed a resource assessment which has resulted in the identification and classification of the project's inputs. The project team has also developed an implementation plan for the activities required to achieve the desired outcomes and impacts. Each of these activities has an associated immediate output which will then result in the desired outcomes and impacts that are essentially the goals of our project. Further details on the aforementioned activities (resource assessment, implementation planning, and objective/outcome setting) are included in the Project Management Plan, presented in Chapter 3. The project specific components of the above logic model are summarized in the following sections:

Inputs:

Project Inputs can be defined as financial and non-financial resources used to complete project activities, produce outputs and achieve outcomes. Our project inputs include, but are not limited to, the following:

- Project team members (Chief and Council, Elders, Subject Matter Experts, Project Manager)
- Teaching Staff
- Procured software and technology (i.e. code.org curriculum, Open edX platform, etc.)
- Financial Contributions

Activities:

Project activities can be defined as the planned work, actions, and events that our project team will undertake to produce one or more outputs. The activities to be undertaken as part of this project include:

- Record written aadsookaanan (sacred stories)
- Produce Waawaa video
- Overdub videos in second language (Nishnabeweemen)
- Produce STEM videos
- Implement K-12 curriculum augmentation
- Upload all data and materials on Open edX

Outputs:

Outputs can be described as the direct result of the planned activities.

- Record of aadsookaanan (sacred stories)
- 2,000 hrs of immersion video
- 1,000 hrs of STEM video
- STEM curriculum framework and materials

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- Digitized publicly accessible version of the above.

Outcomes:

Outcomes can be described as the medium-term impact of the project.

- Increase in number of K-12 STEM courses successfully completed by K-12 students,
- Decrease in percentage of K-12 students needing remedial help in STEM subject areas
- Increase in number of K-12 students who have at least a basic ability to code
- Increase in number of K-12 students who know the key concepts expressed in each of our core aadsookaanan
- Increased annual participation rate in number of traditional Nishnaabe activities for K-12 Students
- Minimum 2,000 hours of Nishnaabe language acquired by graduating eighth-graders
- Minimum 1,000 hours of Nishnaabe-language STEM video successfully completed by graduating high school seniors

Impact:

Impacts can be described as the long-term outcome of the project. For the Biigtigong Nishnaabeg Smart Cities project this includes impacts to our community as well as to society as whole, as described below:

Community Impact:

- Youth who are "better-educated"
- Youth who are "more-employable"
- Youth who are "better-grounded" in their Nishnaabe identity
- Youth who are "more holistically Nishnaabe"

Social Impact:

- Preserved language
- Preserved cultural teachings
- Model for connecting STEM, and traditional/cultural learning
- Onboarding approach to creating Smart Cities regardless of current resources or capacity.

Indicators & Milestones:

Key Performance Indicators (KPIs) allow project managers to gauge whether the planned activities have been successful. This is measured by how well they have been able to meet the objectives of the project. The four (4) main objectives for the project have been outlined in Chapter 3. The completion of the activities outlined in the implementation plan for this project should satisfy the objectives of the project and should bring tangible value added to the community and society as a whole.

It is important to have both qualitative and quantitative indicators for tracking, measuring and evaluating performance, to capture the holistic perspective of the project goals. It is also important

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to select a reasonable number of indicators to ensure that performance measurements are met and accomplished, while not over specifying and removing opportunities that may evolve throughout the project lifecycle.

Quantitative Key Performance Indicators (KPI):

The following section outlines some of the KPIs identified for the performance measurement process of our project. This section details the KPI, the data source and associated responsible resource. The table following this section summarizes this information in the context of associated outputs, outcomes, and target completion dates.

1. Number of aadsookaanan lessons created
2. Number of hours of video produced
3. Number of courses for which curriculum is implemented

The above KPIs are designed to track performance with respect to the outputs for this project. Data will be provided in the form of a summary report to be submitted by the SMEs to the project manager who will then report to the advisory committee on a biannual basis.

4. Number of K-12 STEM courses successfully completed by K-12 students
5. Percentage of K-12 students needing remedial help in STEM subject areas
6. Number of K-12 students who have at least a basic ability to code
7. Number of K-12 students who know the key concepts expressed in each of our core aadsookaanan
8. Annual participation rate in number of traditional Nishnaabe activities for K-12 Students

Qualitative Key Performance Indicators:

1. Teacher feedback and opinions
2. Student feedback and opinions

Other Key Performance Indicators

In addition to the specific KPIs that the project team has identified for tracking performance on specific project outputs and outcome, all outputs will also be evaluated through implementation of financial- and schedule-based KPIs. Financial- and Schedule-based KPIs for reporting on outcomes are less reliable and therefore these KPIs will only be associated with the following project outputs:

1. Estimated Budget vs. Actual Expenditures (Financial)
2. Target Completion Date vs. Actual Completion Date (Schedule)

Source of Data and Reporting Role and Responsibilities

With respect to tracking the Key Performance Indicators listed above, much of the data required including; participation rates, hours of aadsookaanan and STEM video developed, student grades etc. can be collected directly from the open-source online Open edX platform. Clear and concise

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reporting of the Key Performance Indicators will also be a vital component when measuring the progress made throughout this project.

Since teaching staff will be responsible for the direct oversight of student's engagement with the curriculum (i.e. Grading), they will play a large role in assessing and reporting on the performance of students and the quality of educational materials developed. Reporting of these performance indicators will then be communicated to the project team for further analysis.
The project team will be responsible for tracking their internal performance, regarding budgeting and scheduling.

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Program Outputs and Outcomes	Indicator	Data Source	Frequency	Baseline	Target	Date to Achieve Target	Data Collection Resource
Output 1 Record of aadsookaanan (sacred stories)	# of aadsookannan lessons created	Report from Elders and Project Team	Bi-annually	0	50	August 2024	SMEs – Elders &Project Manager
Output #2 – Immersion Video	# of hours of video	Report from Video Production Team	Bi-Annually	0	2,000 hrs	August 2024	SMEs - Video Production Team & Project Manager
Output #3 – Billingual STEM Video	# of hours of video	Report from Video Production Team	Bi-Annually	0	1,000hrs	August 2024	SMEs - Video Production Team & Project Manager
Output 4 - STEM curriculum framework and materials for k-12	# of courses for which curriculum is implemented	Teaching Staff and SMEs	Bi-Annually	No Grades	Grades K-12	August 2024	Teaching Staff
Outcome 1: Youth who are "better-educated"	• # of K-12 STEM courses successfully completed by K-12 students • % of K-12 students needing remedial help in STEM subject areas • Teacher opinion (qualitative) • Student opinion (qualitative)	Summary Report from Teaching Staff	Bi-Annually	None	Increase	August 2024	Teaching Staff
Outcome 2: Youth who are "more-employable"	• # of K-12 STEM courses successfully completed by K-12 students • # of K-12 students who have at least a basic ability to code • Teacher opinion (qualitative) • Student opinion (qualitative)	Summary Report from Teaching Staff	Bi-Annually	None	Increase	August 2024	Teaching Staff
Outcome 3: Youth who are "better-grounded" in their Nishnaabe identity	• # of K-12 students who know the key concepts expressed in each of our core aadsookaanan • Annual participation rate in number of traditional Nishnaabe activities for K-12 Students • Teacher opinion (qualitative) • Student opinion (qualitative)	Summary Report from Teaching Staff	Bi-Annually	None	Increase Reach and obtain Positive Opinion Feedback	August 2024	Teaching Staff
Outcome 4: Youth who are "more holistically Nishnaabe"	• Minimum 2,000 hours of Nishnaabe language acquired by graduating eighth-graders • Annual participation rate in number of traditional Nishnaabe activities for K-12 Students • Minimum 1,000 hours of Nishnaabe-language STEM video successfully completed by graduating high school seniors • Teacher opinion (qualitative) • Student opinion (qualitative)	Summary Report from Teaching Staff	Bi-Annually	None	Increase Reach and obtain Positive Opinion Feedback	August 2024	Teaching Staff

*All outcomes will also be subject to the financial and schedule based KPIs as described in this chapter and the proposal in general.

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Payment Schedule

Understanding that the intent is to develop an outcome-based contribution agreement with Infrastructure Canada, where payments will be triggered by the successful achievement of progress toward outcomes, we have developed a payment schedule that is simple, manageable and associated with the completion of milestones as outlined in detail in Chapter 8.

Risk Management

Identifying risks that may be presented throughout the project lifecycle is an essential component of project management as it allows the project team to proactively establish mitigation strategies to effectively minimize the impact of the risk on the project before it occurs. The table below summarizes a list of potential risks related to the above Key Performance Indicators, as well as the associated mitigation strategies that will be implemented to ensure that the delivery of this content remains effective, up to date, and on schedule.

Risks	Mitigation Strategies
Lag in completing activities could negatively impact project outcomes	Project implementation plan includes Ramp-Up strategy to capitalize on efficiencies in activities
Lack of Student Participation	Incorporation of Immersion and STEM education into existing curriculum provides double-duty lessons to ensure student involvement
Difficulty with Curriculum Implementation	Ramp-up capabilities of Code.org (for example) means that students can be exposed to coding in Grade 5 only, and still proceed to Python in Grade 6, and Robotics in Grades 7 and 8. In other words, the first few years of K-5 curriculum implementation has a significant buffer to include all experience and skill levels. With respect to Grade 6 and above, and experience or previous coding exposure is an improvement on the current curriculum. By the end of the 5-year implementation period, it is expected that any obstacle associated with curriculum implementation will be overcome.
Resources (Human or Technological) are no longer available	Only a few language speakers and Elders can produce aadsookaanan. This highlights the critical nature of this project. The likelihood of any human resources no longer being available is very low, but the impact if this is the case would be significant.
Curriculum becomes outdated	Reliance will be placed on existing websites for STEM education (i.e. code.org). As these are established organizations, that are constantly updating and revising content to better engage youth and other users in this field, there is little chance that this curriculum will become dated. However, SMEs will continuously monitor content and explore alternatives should the desired content become outdated or unavailable.

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Chapter 3: Project Management Plan

Introduction

A Project Management Plan (PMP) is used to manage the implementation of a project through the formal documentation of any actions necessary to define, prepare, integrate and coordinate the various project activities. The PMP defines how the project will be executed, monitored, controlled, and closed. Project Management is an iterative process and as such, the PMP acts as a living document, which is progressively elaborated upon throughout the course of a project. As part of the finalist stage, our project team has developed a Project Management Plan (PMP) for the implementation phase of the project that includes the following:

1. Project scope, scheduling, sequencing, and dependencies
2. Resource assessment, including human, material, and financial (e.g. workforce capacity, infrastructure readiness, and related initiatives already underway) that are sufficient and appropriate to the achievement of outcomes
3. Strategies for: Risk identification and appropriate mitigation
    a. Procurement, including alignment with technology and partnership requirements
    b. Stakeholders, including analysis of impact and influence
    c. Communications, including strategies that promote community involvement and transparency and tailor to diverse stakeholders and projects
4. Monitoring, controlling, and reporting strategies and checkpoints for contingencies and course corrections, if necessary
5. Approach to sustaining projects beyond the lifecycle of the Challenge.

The following chapter summarizes our team's Project Management Plan, with reference to the appropriate chapter of the proposal that will provide supplementary information. When proceeding with the project, the information contained within this proposal will be restructured to serve as the various project management materials needed to guide the project team through the implementation of the project and beyond.

Project Scope, Scheduling, Sequencing & Dependencies

The scope of our project includes the development of 2,000 hours of Nishnaabe-language immersion videos, the content of which will be our core aadsookaanan (our sacred stories, our philosophical foundations, the building blocks of our Nishnaabe worldview). It is intended that this will create understanders of our Nishnaabe language who can then go on to successfully complete an additional 1,000 hours of STEM educational video, the audio of which is delivered in our Nishnaabe language. It is worth reiterating that the model being developed can be used for any other language or culture, the idea is to blend STEM education with tradition, to create leaders of tomorrow with a strong connection to their traditions and cultures. For example, the WaaWaa videos can be overdubbed in any language and be just as useful. It is our belief that this is truly a Canadian approach to developing Smart Cities.

This project will move Nishnaabe people from being mainly passive consumers of technology to being active, effective STEM-educated administrators, managers, and users of data who are able to achieve meaningful outcomes for themselves, their community, and other communities. Upon completing high school, our youth will have received more than 2,000 hours of mobile-enabled,

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online Nishnaabe-language immersion instruction in all of our core aadsookaanan (our sacred stories, our philosophical foundations, the building blocks of our Nishnaabe worldview).

Additionally, our youth will be nearly-completely able to comprehend spoken Nishnaabemwin, will have attained a basic proficiency in coding and robotics, and will possess a strong foundation in mathematics and science. All STEM subject videos and courses will be available under a creative commons license, in both Nishnaabemwin and in English. All of this education will occur in a blended-learning environment with a strong real-world participation component built into the program. The eLearning functionality of our community's open source, mobile-enabled, Learning Management System (LMS), Open edX, facilitates the learning of the STEM subjects. And, the eAcquisition functionality of Open edX facilitates the acquisition of our Nishnaabe language. The entire educational experience is tied together with the meetup forum functionality of Open edX serving as a bridge between the digital, online world and the material, real world. Our youth are strongly encouraged and empowered to participate not only in online communities, but in the traditional Nishnaabe activities going on in the real-world community thereby bridging the gap between the online and real world. Based on this scope of work, the following project management plan has been developed to guide the project team through the implementation phase and beyond. This planning template can also be utilized by other communities when adopting our onboarding approach to a smart city.

It should be noted that this PMP is based on our approach to develop a smart city through the integrated delivery of our culture, language and STEM education; however, other communities that choose to replicate this approach will be able to tailor their project to reflect their culture and language. The products and outcomes of our project, including templates, videos, and curriculum will be made readily available in an open source and transparent format, to be accessed by any community wishing to replicate our approach to developing a smart city.

Project Objectives:

As previously mentioned, our project seeks to achieve the four (4) objectives or outcomes, listed in our Challenge Statement. These objectives are summarized below but are presented in more detail in Chapter One (1), Vision.

Objectives and Measurable Outcomes:

Objectives		Progress Indicator/Measurable Outcome
1.	Youth who are "better-educated"	• Increase in number of K-12 STEM courses successfully completed by K-12 students, • Decrease in percentage of K-12 students needing remedial help in STEM subject areas
2.	Youth who are "more-employable"	• Increase in number of K-12 STEM courses successfully completed by K-12 students, • Increase in number of K-12 students who have at least a basic ability to code
3.	Youth who are "better-grounded" in their Nishnaabe identity	• Increase in number of K-12 students who know the key concepts expressed in each of our core aadsookaanan

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		• Increased annual participation rate in number of traditional Nishnaabe activities for K-12 Students
4.	Youth who are "more holistically Nishnaabe"	• Minimum 2,000 hours of Nishnaabe language acquired by graduating eighth-graders • Increased annual participation rate in number of traditional Nishnaabe activities for K-12 Students • Minimum 1,000 hours of Nishnaabe-language STEM video successfully completed by graduating high school seniors

Scheduling, Sequencing and Dependencies:

To ensure smooth project delivery, project management tools must be implemented. These tools allow the Project Team to understand each task at hand and the relationship, or interdependencies, that they share in reaching project completion. Dependencies show relationships between successive tasks and outline what tasks must be completed prior to beginning another. Using dependencies enables the Project Team to establish a critical path for the project; highlighting key events that must be met to drive the project to completion. This critical path will be depicted visually in the form of a Gantt chart.

Often dependencies result from working with different internal and external stakeholders and, as a result, it is important to establish dependencies before project commencement. As dependencies increase the risk associated with project roll-out, a number of tools and techniques can be initiated to mitigate the effects that they may have.

As a starting point, internal and external dependencies have been considered to determine associated levels of risk. Please refer to subsequent sections and chapters for descriptions of associated risks. Likewise, the project implementation plans for all project components, presented in Appendix A & B, also show dependencies between activities. The Project Team have been, and will continue to be, assigned to specific tasks and respective dependencies. As the project moves forward, it is likely that further dependencies and subtasks will take form. To ensure the timeline is not affected by these changes, Bi-Monthly Project Team meetings will take place to proactively coordinate around these obstacles and re-establish the critical path. These meetings will be identified in the project schedule.

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Project Components:

There are four main parts of this project, all to be hosted on the Open edX learning management system:

1) E-Learning, K-12 curriculum augmentations
2) Meetup forum real-world connections
3) eAcquisition, 2,000 hours of immersion video
4) Bilingual STEM video - 1,000 hours of STEM course video

1) E-Learning, K-12 curriculum augmentations

With respect to the augmentations to the existing curriculum, the project team has developed a detailed implementation plan to complete the following:

1) Implement code.org curriculum in grades k-5
2) Implement python curriculum in grade 6
3) Implement Robotics curriculum in grades 7 and 8
4) Implement CompTIA A+ curriculum in grades 9-12

The project team will rely on existing and proven curriculum for the implementation of the k-12 augmentations. Teachers will be required to incorporate these curriculum augmentations as part of their existing lesson planning process. All curriculum will be implemented via blended learning and growth mindset approaches.

In terms of the implementation schedule, the selected curriculum of code.org (for example), was selected as it provided "ramp up capabilities" meaning that kids being introduced to this curriculum for the first time in grade 5 will be able to complete "ramp up lessons" given that they did not have exposure to the K-4 curriculum. Similar, the 5-year implementation schedule for all other grades and curriculums will follow as similar approach, where necessary.

Please refer to Appendix B for additional information regarding our project implementation process, timelines and outputs for eLearning, K-12 curriculum augmentations project components.

2) Meetup forum real-world connections

The Meet-up functionality of the Open edX platform will enable students and community members to not only connect with the digital community, but also the real-world community, as well as the land and traditional activities. This mobile-enabled meetup forum functionality, provided by Open edX, will serve as the central 'online gathering' place which will facilitate the bridging and interfacing of the digital world with the material, real world. All community members will have access to each other via this online gathering place. This functionality is provided directly within Open edX and will provide our youth the opportunity to express their desire to attend a particular traditional Nishnaabe activity. Likewise, community members who are planning an activity will be able to express their intentions in the meetup forum functionality of Open edX, thereby providing additional options for our youth to take part in while remaining in the embrace of the real-world community network. As this is a function of the Open edX Platform, implementation

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will be relatively simple, requiring the development and provision of instructions to participants and encouraging participation, as part of our overall implementation strategy.

3) eAcquisition and 4) Bilingual STEM course video

With respect to the eAcquisition immersion video and STEM course videos, the project team has developed a detailed Implementation Plan to complete the following:

- Reconstruct and write our core aadsookaanan
- Produce Waawaa video (2,000 hrs)
- Overdub Waawaa video and/or produce Nishnaabe-language immersion video (live-action or 2D-animated)
- Produce bilingual (Nishnaabe-language and English-language) STEM video (1,000 hours)

Please refer to Appendix A for additional information regarding our project implementation process, timelines and outputs for the eAcquisition and Bilingual STEM Course Video project components.

To summarize, the approach taken in terms of the production of the Waawaa video and Nishnaabe language immersion video and bilingual STEM videos has been to intentionally ramp up production over the course of the 5-year project implementation. The reason for this is to allow for review and critique of the first round of videos to allow the project team to adjust course and make any improvements, as deemed necessary. Likewise, it is anticipated that the production of Waawaa videos will become more effective over the course of the project implementation plan, and therefore our team will be able to increase output over the duration of the project.

Based on our pilot studies we have identified that the level of effort to produce one hour of Waawaa video (not including overdubbing) can vary significantly. We have developed our scheduling and implementation plan with sufficient buffer and a ramp up timelines to mitigate this scheduling risks.

Implementation Plans – Strategy

These implementation plans have been developed through reliance on the Project Sponsor and Subject Matter Experts. Project Participants shall follow the implementation plan and schedule. The efficacy of the implementation strategy will be reviewed at each Bi-annual Advisory Team meeting. Should significant issues be encountered during implementation, the project participants shall notify the project manager who can call an ad-hoc advisory team meeting to review the plan and make any necessary course corrections.

Gantt Chart

A detailed Gantt Chart outlining each stage of the project, and all project participants and stakeholders, will be revisited and updated throughout the project lifecycle to ensure smooth transitions between project phases. A Gantt Chart is a PM tool that can be used to summarize critical stages of the project, dependencies and anticipated duration of tasks, as well as providing an effective resource for tracking progress throughout the project lifecycle. Gantt Charts show the progression and duration of tasks while also showing dependencies of different events within the project. This schedule will be reviewed with the Project Team before project commencement and regularly reviewed and revised as necessary to avoid schedule slippage, reduce redundancy in effort, and expedite successful project delivery.

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Resource Assessment

As part of the Project Management Plan, it is necessary to assess the availability and capacity of resources to ensure they are sufficient to achieve outcomes of the project. Biigtigong Nishnaabeg has been developing our internal resources over several years, which has enabled us to be in a position where we can achieve the goals and outcomes of this proposed project. The resources identified as required to complete this project include:

- Human resources with expertise in areas of language, technology, culture (elders), finances, education
- Technological/material resources
- Capacity building and related initiatives
- Financial resources

Human Resources

Human resource management is key when implementing a project as this dictates the connection between the available workforce and the ability of a project's strategies, objectives and goals to be achieved. The best practice for human resource management can be understood through the following six steps;

1. Develop and Revisit project objectives
2. Assess existing capabilities and capacities
3. Estimate future HR requirements
4. Determine job and resource requirement
5. Implement a Human Resource Management Plan
6. Evaluation and corrective action

This non-linear process will be implemented by our team in completing the project and each phase can be revisited as needed, and at minimum at our Bi-Annual meetings.

The Human Resource Management Plan will be used to provide guidance on how team members will be defined, staffed, managed, and eventually released throughout the project lifecycle. Each member of the team will be assessed based on the following:

- **Role** – function assumed by person on project.
- **Authority** – right to apply resources, make decisions, sign approvals, etc.
- **Responsibility** – duties of work on project team
- **Competency** - skill and capability required to complete assigned activities.

One tool that will be developed is a Responsibility Assignment Matrix (RAM). This method of project management assigns specific actions to each member of the team. Organizing the responsibilities of the team members in a RAM will allow for more organization and can be used to identify a gap in the project team's ability to complete tasks.

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Project Roles & Responsibilities

We have secured the necessary human resources for the successful development and implementation of this project. Biigtigong Nishnaabeg has a strong talent pool and exceptional human resources committed to this project. Broadly this includes

- Community leadership (Chief and council)
- Subject Matter experts
    - (in areas of language, culture and STEM)
- Technical staff
- Administrative support (finalizing)

Current key human resources are identified in the table below:

Role	Participant(s)	Responsibilities
Project Sponsor	Chief & Council	• Represent community • Provide project oversight and guidance • Review/approve some project elements
Subject Matter Experts	• Language consultant • Elders • Industry Partners • Teachers	• Provide language expertise • Provide cultural expertise • Provide Curriculum Expertise
Advisory Committee	Community and Industry Leaders	• Approves major funding and resource allocation strategies • Authorizes significant changes • Resolves conflicts and issues • Provides clear direction to the Project Manager • Review project deliverables and milestones • Identify risks and mitigation strategies
Project Manager	Band Administration	• Manages project in accordance to the project plan • Coordination with Advisory Committee • Supervises consultants and SMEs • Provide overall project direction • Direct/lead team members toward project objectives • Handles problem resolution • Manages the project budget
Project Participants, incl. technical staff and admin support	• Elders • Teachers • Language consultant • Video production team • Others to be identified by SC project Advisory committee	• Communicate project goals, status and progress throughout the project to other participants, and project manager. • Review and approve project deliverables and accountable for milestones • Creates or helps create work products (videos, written materials, curriculum). • Coordinates participation of individuals, teams and stakeholders • Provide knowledge and recommendations • Evaluate outcomes and provide input on key performance indicators • Helps identify and mitigate project risks • Assure quality of products that will meet the project goals and objectives • Achieve milestones on time and on schedule

Other roles and responsibilities are described in relevant sections of this proposal, including Chapter 5 which provides the roles and responsibilities of the governance structure for Biigtigong Nishnaabeg First Nation.

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Infrastructure/Material Resources:

The infrastructure required for this initiative includes the eLearning, eAcquisition, and meetup forum functionalities of the Open edX platform. This online platform will be the primary method of delivering language and STEM training to the target audience. Other technologies/software include Code.org, Tynker.com, Lego.com, CompTIA A+ Exam preparation materials and curriculum, etc. Additional information related to technology resources are included in Chapter 4 of this proposal and will be available to the project team as part of the Project Management Plan.

Capacity Building and Related Initiatives

As part of the Project Management Plan, it is important for the project team to have a solid understanding of existing and ongoing initiatives that may influence the Smart Cities project. The project team has identified three (3) existing projects of particular importance to this project, and that should be monitored as part of the project management process. Project leads from each of the below initiatives are already identified as key stakeholders as part of the Smart Cities process and therefore will continue to be consulted over the course of the project implementation, and beyond, as outlined in our engagement plan presented in Chapter 6.

- **Language Project:** ongoing project to capture and preserve the Nishnaabe language and more specifically the Biigtigong dialect.
- **Curriculum Development:** ongoing project to emphasize cultural and land-based learning activities for K-8 students.
- **New School Project** The community has identified continued education, job readiness and skills training and development as a high priority. Biigtigong Nishnaabeg is currently in the process of designing a new elementary school and Business Training and Education Complex. These facilities can be used to promote this program and facilitate participation by youth and young professional. By having this easy access to the target audience this will ensure that the program is adopted.

Financial Resources

This project will rely on the financial resources provided by the community, other participants and Infrastructure Canada, as presented in Chapter 8.

Strategies for: Risk identification and appropriate mitigation

With any given project there is the potential of risk throughout its lifespan. Risks can be any influence which affects the success of a project (i.e. in terms of budget or schedule). Therefore, risk management is an essential process of identifying, analyzing and responding to these influences that may occur, to ensure the project stays on track. Specifically, risk management involves identifying categorizing, prioritizing and planning for risks, with risks being identified as anything that could potentially impact the success of the project (deadlines, quality, or budget etc.). Throughout this project, risk management will be approached as an iterative and proactive process.

The project team will revisit the Risk Management Strategy throughout the course of the project as needed to identify and monitor the potential risks during each phase of the project. Once a Risk Management Strategy has been finalized, deviation from the agreed upon schedule/budget/scope of work will be identified and promptly communicated amongst the project team so that corrective actions can be taken in a timely manner. It is the intent there will be regular project meetings held to monitor the progress made and to identify any potential risks.

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The initial Risk Assessment has resulted in the identification of initial project risks, and these are presented throughout our proposal. Key Risks and mitigation strategies are summarized in the table below (Additional risks are identified throughout our proposal):

Risk	Likelihood	Impact	Risk Management Approach/Mitigating Actions
Low Student Participation	Medium	Medium	• Program is designed to be interactive and hands on approach • Meaningful outcomes • Onboarding and recruiting strategies • Incentives – i.e. Summer Student Employment • Community celebrations • Good co-op placements • Offer program neighboring First Nation • Develop on-line resources for scalable and replicable
Technology, software and curriculum becomes outdated	Low-High	Medium	• Over time (long-term) the chosen technology and curriculum may become outdated. Responsibility of project team (including SMEs) to continuously identify alternatives. • Designed curriculum based on building blocks, so that the principles of STEM curriculum will not change, • Teachers to continue to revisit teaching lessons and curriculum through existing processes.
Nishnaabemwin audio overdub cost is too high	Medium	High	• Audio-video editing software & related training • Establish work flow procedures and accountabilities • Set up a review & monitoring system • Establish best-practices • Consider use of a first-speaker as a consultant • Research animation and other technological options • Focus priorities and on core competencies
Extreme high cost of uploading and downloading video	High	High	• ISP (PRDC) is providing free on-site services to assist in the offloading, downloading and uploading of video
Expensive video backup system; cloud service unreliable for now	Medium	High	• Develop safe and reasonably costed manual backup system • ISP (PRDC) is setting up a free back up system on their servers
Loss of $100,000 financial contribution from Chief & Council	Low	Medium	• Examine projects and make adjustments (cuts) where necessary • Ensure efficiency and effectiveness of projects • Provide and show value for the $100,000 donation – produce results • Apply for other funding and financial contributions
Change in partners/3rd party involvement or withdrawal.	Low	High	• Build Relationships • Formal agreements • Identify alternative strategies • Continually monitor risk
Admission of new partners.	High	Medium	• Admission mechanisms

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			• Needs based; team approval process • References – due diligence
Conflict of Interest	Low	Medium	• Build strong communication • Maximum transparency • Implement Conflict of Interest Policy
Potential inequalities in partners' resources and expertise determine their relative influence in the partnership's decision making.	Medium	Medium	• Focus on consensus-based decision making • Address in formal agreements • Build relationships • Access to dispute resolution process • Involve experts on Executive Board
Poorly defined shared vision and objectives.	Low	Medium	• Develop shared vision with clearly defined objectives • Link corporate objectives/organizational objectives to the project objectives • Training and Education sessions • Annual and Bi-Annual reviews
performance targets not met in a satisfactory or timely way.	Low	High	• Develop an agreed upon Performance Management framework • Conflict management/resolution procedures • Encourage joint ownership of problems & solutions • Relationship building
Failure to engage key stakeholders in meaningful ways.	Low	Medium	• Awareness & education of engagement strategy • Communication strategy • Performance measurements inclusion • Evaluation strategy
Failure to comply with relevant laws and regulations.	Low	Low- High	• Identification & education of laws & regulations • Dispute resolution process • Develop safeguards throughout project
Partners/3rd party - Lack of understanding of local culture.	Medium	Medium	• Cultural awareness training • Provide explanations – no assumptions • Dispute resolution
Financial risks No strategic approach to issues of risk, costs and benefits	Medium	Medium	• Define and agree with approach to dealing with costs and benefits of the • Continuous monitoring & reporting • Utilize Finance Department & Finance Committee
Loss of autonomy	Low	High	• Rigorous selection of partners • Clear agreements
Lack of capacity, skills, knowledge and experience	Medium	High	• External Recruitment Plan • Local training & development plan • Outsourcing and Contracting Options • Secondments
Insufficient internal & external communication.	Low	Medium	• Establish communication plan & review • Regular meetings • Structured reports • Use of collaboration tools

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The goal of our risk assessment process is to identify, characterize, prioritize and document a mitigation approach relative to those risks which can be identified prior to the start of the project. The Risk Assessment will be continuously monitored and updated throughout the life of the project and will be communicated with appropriate stakeholder as per our engagement plan, presented in Chapter 6.

Since mitigation approaches must be agreed upon by project leadership (based on the assessed impact of the risk, the project's ability to accept the risk, and the feasibility of mitigating the risk), it is necessary to allocate time during each Advisory Team meeting, dedicated to identifying new risks and discussing mitigation strategies.

Procurement, including alignment with technology and partnership requirements

Our procurement strategy will follow our internal policies and procedures which mandate minimum requirements for service delivery, contract terms, First Nation involvement, etc. For this project the majority of procurement requirements have been established through development of this proposal and are the approach is relatively uncomplex in that they are with preestablished service and software providers, products and partners.

Stakeholder identification, including analysis of impact and influence

A stakeholder refers to any individual, organization or group of people with an interest in the project or the ability to affect its outcome. All stakeholders therefore have a vested interest in the successful outcome of a project. From previous engagement experiences on other projects, we understand the importance of including the diverse groups that will be impacted and/or could impact the project. We understand that this journey, especially the reclamation of our language and aadsookaanan, will potentially stir emotions resulting from historical impacts from cultural genocide. We further understand, that it is necessary to walk through these hurts together in order to move forward, heal and reclaim our culture and identity. This proposal required the input of everyone, as it provided another opportunity to build stronger individuals, families, community and a Nation.

In identifying our stakeholders, we considered those who would be immediately impacted and those impacted according to our 7th generation principle (See Chapter 5). Various target groups have been identified and strategies established to facilitate meaningful engagement. As we move forward from development to implementation, we remain committed to developing effective engagement processes that build upon best-practices while creating new and innovative ways of engagement with the project stakeholders. Furthermore, expectation, assumptions and potential risks for each stakeholder will be identified through this engagement. Having an understanding of what is considered the most important outcome for the project amongst the different stakeholders allows project managers to tailor their approach to align with and meet stakeholders needs. Please refer to Chapters 5 and 6 of the proposal for additional details on our stakeholder management process.

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Communication Strategies

Having the support and involvement of all stakeholders will add value to the project, not only through meaningful participation but to also allow for open dialogue and feedback throughout the project. The community engagement strategies completed to date for this project have focused on using our cultural practices to empower youth and community members in a meaningful way.

Throughout the implementation stages of this project a number of these strategies, including community meetings, reporting, surveys, working groups and traditional ceremonies, will be utilized to ensure the continued involvement of the stakeholders at each stage of the project. Most importantly, knowledge sharing and discussions with community members, particularly elders, will be integral to better understanding our traditional Nishnaabe language.

Engagement events (i.e. working groups, community meetings) will be advertised to community members and the general public through the appropriate channels, including but not limited to social media, newsletters and event bulletin boards. A full Engagement Plan for the project can be found in Chapter 6.

Monitoring, controlling, and reporting strategies

Monitor and Control Project Work is the process of tracking, reviewing, and reporting the progress to meet the performance objectives defined in the Project Management Plan. The key benefit of this process is that it allows stakeholders to understand the current state of the project, work completed, budget, schedule, and scope forecasts.

Each member of the project team will be responsible for monitoring the schedule and tasks completed under their supervision. Thus, information sharing and regular communication amongst the project team will be a key component for success.

Should the project team be unable to complete tasks in the allotted timeframe, corrective measures will be implemented immediately, to ensure the project continues without significant delay. Corrective actions may include more frequent project update meetings/conference calls which will allow the project team to collaboratively adjust the internal schedule of the project to ensure all tasks can be completed.

Bi-annual and annual reporting will be conducted and presented to stakeholders throughout the duration of this project, as per the communication and engagement strategy. Bi-Annual reports will coincide with the financial reporting aspect discussed further in Chapter 8.

In terms of reporting to be received from Teachers, reporting to the project team will be completed in the form of summarized and anonymized data, following an agree to template. Reporting to parents and students will follow the exiting process governing their current reporting practices (i.e. report cards).

Approach to sustaining projects beyond the lifecycle of the Challenge

Our project is designed to be implemented over the course of 5 years, with official project initiation beginning September 2019 and implementation ending in August 2024. That being said, significant resources are already in place, and much effort has been expended in developing this

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proposal, which will allow us to hit the ground running. Notably, this project does not have an "end" to its lifecycle, instead the project intends to implement the curriculum which can then continue indefinitely. Of course, there will be the need to continuously review, adjust and enhance the approach and curriculum content, especially in terms of STEM education, but the entire idea of this project is to provide long lasting change to our community which can then be replicated and implemented by any community across Canada or the world.

As previously mentioned, our approach to creating a smart city is an onboarding strategy that would provide long lasting effective change to communities, through empowering youth (and others), through cross-generational transfer of cultural knowledge as well as the much-needed STEM knowledge required to ensure active participation in a smart technology driven economy.

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Chapter 4: Technology

Introduction

Technology in Biigtigong's on-reserve elementary school and on-reserve high school will help revitalize language and culture, will enhance student learning, will provide students with modern bilingual STEM education, will strengthen students' real-world connections to our Biigtigong territory and to other community members, will improve the efficiency and productivity of teaching staff, and will facilitate communication among students, teaching staff, parents, and elders.

The Vision for Technology

Technology is being utilized firstly as a foundation of our entire proposal – the delivery of the Learning Management System – namely Open edX. Open edX, in turn, then serves as the platform atop which our K-8 students will be acquiring their Nishnaabe language – via 2,000 of immersion video instruction, the content of which is our aadsookaanan (our sacred stories, our philosophical foundations, the basic building blocks of our Nishnaabe worldview). Our aadsookaanan will be reconstructed and written, over the five-year period of this proposal - the aadsookaanan reconstruction process assisted, as well, by technology. Additionally, our students in both elementary school and high school will also have STEM education delivered to them on the Open edX platform in a blended-learning environment (i.e., brick-and-mortar instruction augmented with an online component), by augmenting our current K-12 curriculum with the following:

- For our grades K-5 students, the Computer Science Fundamentals curriculum of Code.org.
- For our grade 6 students, a coding course using the Python programming language.
- For our grades 7 and 8 students, two courses in LEGO Robotics utilizing an expanded, projects-based version of the LEGO MINDSTORMS EV3 Curriculum.
- And, for our high school students, the full curriculum of the CompTIA A+ information technology exam preparation.

Additionally, for our high school students, they will receive, through the medium of our Nishnaabe language, STEM course instruction via 1,000 hours of STEM course videos (available in both the Nishnaabe-language and the English-language.) Professional development will be provided throughout the five-year period for all staff to ensure that culture-based technology is used to transform learning and language acquisition opportunities for all students.

Community informationals will be delivered throughout the five-year period for all community members – especially parents of students – to maintain their informed technology-related decision making.

Plan Duration

The duration of the Plan will be five years (September 2019 through August 2024). The Plan will be reviewed and updated bi-annually. The focus of this technology plan is the curriculum augmentations, community informational, and professional development components.

Stakeholders

The stakeholders to this technology plan include the whole community – including students, teachers, administrators, parents, information technology staff, and elected leaders.

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K-12 Curriculum Augmentation

We are building a modern bilingual K-12 STEM curriculum by augmenting our current K-12 curriculum. This chapter will focus on those planned-for K-12 curriculum augmentations.

Technology Plan Vision and K-12 Curriculum Augmentation Rollout by Year

Vision for Technology and K-12 Augmentation

Our vision for technology is the curriculum represented graphically in Chapter 1's Figure 1-1, delivered via the Open edX platform.

Rollout by Year

The yearly rollouts below support the Vision for Technology and K-12 Augmentation. These rollouts begin with an exit goal that states what we expect twelfth grade students graduating from our school to know and be able to do and is followed by yearly rollouts of technology Types 1 and 2 for students and staff who will support learning in our classes and our overall instructional program. These rollouts are intended to guide the implementation of technology across our K-12 curriculum, professional development of teaching staff, educate the community on the relevant technologies, deliver bilingual K-12 STEM knowledge, and support the reconstruction and revitalization of our Nishnaabe language and aadsookaanan (sacred stories).

Exit Goal: Students graduating from Biigtigong's high school (whom have also graduated from Biigtigong's elementary school) will be able to code in an introductory text-based programming language (Python), will be able to assemble and control robots using a text-based programming language (ROBOTC, a language similar in structure to the C programming language), will have successfully completed the exam preparation curriculum for both parts of the CompTIA A+ exam (exam #220-1001, and exam #220-1002), will be able to nearly-completely understand their Nishnaabe language, and will know all of their core aadsookaanan.

Yearly Rollouts of Type 1 Technology:

Year 1 (Sep. 2019 – Aug. 2020)

- We begin using Appsembler, our chosen SaaS-provider of the Open edX platform, to deliver our augmented K-12 curriculum.

Years 2 through 5 (Sep. 2020 – Aug. 2024)

- We continue using Appsembler, our chosen SaaS-provider of the Open edX platform, to deliver our augmented K-12 curriculum.

Yearly Rollouts of Type 2 Technologies:

Type 2: Technologies utilized in our K-12 curriculum

For the rollout schedules of the technologies utilized in our K-12 curriculum, please see Appendix B and Appendix C for each of the five years of this proposal.

Detailed curriculum documents can be found here:

- Code.org – Computer Science Fundamentals curriculum: https://code.org/curriculum/docs/csf/CSF_Curriculum_Guide_2018_smaller.pdf
- Python 1 – Tynker.com's 'Python 101' course curriculum: https://www.tynker.com/school/coding-curriculum/scope-sequence

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- Robotics 1 and 2 curriculum – LEGO MINDSTORMS EV3 curriculum: https://education.lego.com/en-us/downloads/mindstorms-ev3/curriculum
- CompTIA A+ exam preparation curriculum:
    - Exam #220-1001: https://www.certblaster.com/wp-content/uploads/2018/07/A-plus-220-1001-pdf-Exam-Objectives.pdf
    - Exam #220-1002: https://www.certblaster.com/wp-content/uploads/2018/07/A-plus-220-1002-pdf-Exam-Objectives-1.pdf

Type 2: Technologies utilized in the reconstruction and writing of our core aadsookaanan
In the interest of effective use of space here in this proposal, these technologies will be utilized on an as-needed basis to write our aadsookaanan. These technologies will be utilized throughout all five years of the the five-year period.

Type 2: Technologies utilized in the production and provision of our three types of video
In the interest of effective use of space here in this proposal, these technologies will be utilized on an as-needed basis to record, overdub, animate, and edit our video. These technologies will be utilized throughout all five years of the the five-year period.

Yearly Rollouts of Professional Development and Community Education:

Year 1 (Sep. 2019 – Aug. 2020)
- We begin delivering technology-related professional development to K-12 staff.
- We begin delivering technology-related informationals to community members – especially to parents of students.

Years 2 through 5 (Sep. 2020 – Aug. 2024)
- We continue delivering technology-related professional development to K-12 staff.
- We continue delivering technology-related informationals to community members – especially to parents of students.

Details about the Technologies

In addition to our existing technology, there are two main types of technology needed to implement our proposal. The first type comprises the constituent technologies of our Learning Management System (LMS), Open edX. Broadly speaking, Open edX is *the* technology which houses the entire blended-learning experience which we're planning to deliver with our proposal. The second category comprises all other technologies which enable that experience to occur. This second category includes the technologies utilized in our augmented K-12 curriculum; the technologies used in the reconstruction and the writing of our core aadsookaanan; and the technologies employed in the production and provision of our three types of video: Waawaa immersion video, Nishnaabe-language immersion video, and bilingual (Nishnaabe-language and English-language) STEM video.

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Current Technologies

Current Hardware

Apple iPads *(Student Usage)*	60
Apple iPads *(Teacher Usage)*	5
Apple MacBook Pro laptops *(Student Usage)*	34
Apple MacBook Pro laptops *(Teacher Usage)*	10
Windows desktop PCs *(Student Usage)*	22
Windows desktop PCs *(Teacher Usage)*	4
Apple iMac desktop computers *(Teacher Usage)*	1
Promethean ActivBoard Touches	6
Digital SLR Cameras	2
Digital Cameras/Recording Devices	2

Current Software

Video Editing	Windows Movie Maker, iMovie, Adobe Premiere Pro
Photo Editing	Adobe Photoshop
Office Productivity	For Windows: - Word, PowerPoint, Excel, Publisher, OneNote, Outlook For macOS: - Pages, Keynote, Numbers, Notes

Type 1 Required Technologies

Technologies utilized to deliver our Learning Management System (LMS)

- Open edX platform (open source - GNU Affero General Public License)
    - Open edX iOS mobile app (open source - Apache License)
    - Open edX Android mobile app (open source - Apache License)
    - Written in Python (open source - Python Software Foundation License (PSFL) [a BSD-style, permissive free software license which is compatible with the GNU General Public License (GPL)].)
    - Built on Django (open source - Django's BSD license)
    - Utilizes PostgreSQL relational database (open source - PostgreSQL License [a liberal Open Source license, similar to the BSD or MIT licenses])
- Khan Academy API (free proprietary)
- Appsembler (proprietary SaaS-provider of Open edX)
- Customizations by Biigtigong Nishnaabeg to Open edX platform (open source - GNU Affero General Public License)

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Type 2 Required Technologies

Technologies utilized in our K-12 curriculum

- Code.org (open source - Apache License)
- Khan Academy (free proprietary)
- Python - (open source - Python Software Foundation License (PSFL) [a BSD-style, permissive free software license which is compatible with the GNU General Public License (GPL)].)
- LEGO MINDSTORMS EV3 Software (free proprietary)
- LEGO MINDSTORMS EV3 Robot Kit (proprietary)

Technologies utilized in the reconstruction and writing of our core aadsookaanan

- LibreOffice desktop office productivity software (open source - Mozilla Public License Version 2.0)
- ONLYOFFICE desktop office productivity software (open source - AGPLv3)
- MariaDB relational database (open source - GNU GPL v2.0)
- HeidiSQL free and open source administration tool for the MariaDB relational database (open source - GNU GPL v2.0)

Technologies utilized in the production and provision of our three types of video

- Storywriting and screenwriting software (Mariner Persona, Write Brothers Dramatica Pro, Movie Magic Screenwriter)
- Storyboard software (Moviestorm Filmmaker, Power Production's Storyboard Artist Studio, Storymind StoryWeaver)
- Office productivity software (LibreOffice, ONLY OFFICE)
- Digital Pen (Epic Pen)
- Drawing Tablet (Wacom drawing tablet)
- Mocap-capable 2D animation software (Adobe Creative Cloud - Character Animator)
- Webcam (to interface with mocap-enabled 2D-animation software)
- Microphone and accessories (for recording audio with which to overdub the video)
- Riggable 2D-character creation (Adobe Creative Cloud - Illustrator, and Photoshop)
- 3D modelling software (for the creation of assets for the animatics in the 2D-space 'digital flip chart' immersion instruction by the 2D-animated character) (Sketchup Pro)
- Screen recording software (TechSmith Camtasia)
- Video-editing software (Adobe Creative Cloud - Premiere Pro)
- Audio-editing software (Adobe Creative Cloud - Audition)
- SFTP (Secure File Transfer Protocol) client (WinSCP)
- SSH (Secure Shell) and Telnet client (PuTTY)
- Video player software (VLC Player)

Relevant Applications Elsewhere

These technologies are applicable and useful in governance (especially for effectively engaging community member in all facets of community life), new council member initiation, training of new staff, ongoing professional development of current staff, general community informationals, and bringing the entire organization online.

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Results of Testing and/or Piloting in the Finalist Phase

We achieved fun and excellent results throughout the finalist phase in all of our pilot projects. Our biggest challenge, as we mentioned in Toronto at our November Jury Check-In, was easing the fears of the teachers and inspiring them with hope for new possibilities concerning their lack of technical expertise in the areas of Technology and Engineering. Coding, in particular, seems to have unnerved the staff of our elementary school the most. Our Elementary School's professional development sessions with the teaching staff, their testing and piloting of the technologies in the classroom and the community, including actual blended-learning classroom sessions using Khan Academy and Code.org, building and controlling Lego robots, and employing block-based programming to control circuit boards using Scratch and Makey Makey, transformed these moments of doubt into empowering moments of possibilities (in our teaching staff's own words!).

Approach to Future-Proofing the Technologies

Firstly, most all of our software applications which are not open source have 'safety-net' open source equivalents. This is how we're safeguarding against vendor-generated proprietary constraints and obsolescence while simultaneously enabling transferability and scalability. Our few proprietary choices here allow us to go faster and thus be more efficient and effective with our time due to the fact that we have personnel with considerable experience in the proprietary versions of these software applications. Should, however, any of the vendors of these proprietary software applications which we're using do something which disallows us to continue effectively using their software, we can quickly and near-frictionlessly switch over to the respective open source equivalent software application with little to no interruption in our workflow.

Secondly, while we are certainly onboarding youth into the smart cities future. We're *also* onboarding K-12 teachers and staff, as well as community members in general. The continuing professional development of teaching staff, and the ongoing informing of the community will produce for us a workforce that is able to implement and operate the technologies and systems going forward into the smart future.

Adoption of Architectures, Guidelines, and Initiatives

Had we chosen to install Open edX's software on servers other than Appsembler's, we would have indeed had an an architecture adoption challenge to contend with. Because we are attempting to make this proposal's approach to moving into the smart future as newbie-friendly as possible, we have chosen to simply use Appsembler as our SaaS (Software as a Service) provider of the Open edX platform. The architecture issue thus goes away as we have only a web-based interface to Appsembler to contend with. A very newbie-friendly approach, indeed.

The guidelines that concern us here are the blended-learning guidelines. We are not advocating for an 'online' school. What we are advocating is enhancing brick-and-mortar curriculum delivery with some online options. The guidelines for attaining this hybrid approach is what we are referring to when we use the term 'blended-learning.'

Similarly, the initiative which concerns us here is the Growth Mindset as implemented by Khan Academy. The Growth Mindset can be many things to people. Fir us, we once again, take a newbie-friendly approach. The Growth Mindset in its minimalist form is not allowing students to progress in their curriculum studies without first mastering the content in their current stage of learning. For example, a student receiving an 85% in a math quiz, for example, is made to redo the quiz until that student receives a perfect score. This is a fundamental approach of Khan Academy, and one which we wish to emulate

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on our online quizzes using randomized tests with a large database of possible questions for our students. These randomized tests are what we are referring to in our Type 1 Required Technologies section by Customizations by Biigtigong Nishnaabeg to Open edX platform. These are simple JavaScript scripts placed on the front-end webpages of our students quiz pages on Open edX that create a Khan Academy-like testing experience, rendering it what we are referring to as a Growth Mindset Approach to learning.

Interoperability

- Open edX with Appsembler's API (Application Programming Interface) make the platform interoperable with any other technology one could reasonably choose to interface with.
- Using Khan Academy's API (Application Programming Interface) for Khan Academy courses which we'll be offering inside of Open edX makes this customized aspect of Open edX interoperable with nearly any other technology.
- Existing community systems and services are currently not networked. Open edX will be the platform with which Biigtigong Nishnaabeg begins to connect these community systems and services.

Replicability and Scalability

Because we have chosen a foundational platform which is fully open source (Open edX), which we're augmenting with curriculum components (e.g., code.org) and learning-facilitation aids (e.g., Khan Academy) which, too, are nearly all open source and free of charge, our proposal - nearly in its entirety - is replicable in any community one might wish to bring it to.

As we've stated earlier, in the cases where we have chosen to use a proprietary technology – for example, LEGO, which does not operate in the open source ecosystem – we have been careful to make sure that there are near-equivalent open source options - in this case, Raspberry Pi, which does operate in the open source ecosystem – for that technology.

Additionally, as we state several times throughout our proposal, we are offering an onboarding approach to communities that may not have access to bleeding-edge technology, nor perhaps to bleeding-edge technology's administering engineers, programmers, or operators. It is our hope that by keeping the technology requirements of our proposal to a minimum, making our approach as replicable and scalable as is reasonably possible, and still delivering a smart technology approach, we can thereby help facilitate the spread, and long-term acceptance and flourishing of, smart cities throughout Canada.

Roles and Responsibilities of Technology Partners

Technology partners:

- Software and hardware partners
    - Roles and responsibilities are clearly delineated and articulated in the software licensing agreements of each of the technologies.
- Pic River Development Corporation (PRDC) - *Internet Service Provider (ISP)*
    - Most importantly, PRDC's role is to provide for our Waawaa immersion video producers a place in which to offload their video each week. Without this important role being played by this ISP partner, our video producers are forced to use Dropbox or something similar to upload their video instead of being able to simply offload it. This is not an ideal option as piloted upload times during the finalist phase had been exorbitantly and prohibitively high. Offloading all of their video each week onto the servers at PRDC's office is an extremely time-efficient way to get their video to our Nishnaabe-language overdubber.

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Technology Accessibility and Usability for Uptake and Acceptance

Community informationals, especially for students and parents of students, will facilitate the community's uptake of Type 1 and Type 2 technologies.

Identification of Risks

Technology – Risks and Mitigation Strategies			
Risk	Likelihood	Impact	Mitigation Strategy
Limitations as a result of internet connections.	Medium	High	• Selective over software – set standards & assessment • Minimize use of cloud computing
Video uploading and downloading time is lengthy and irregular.	High	High	• Agreement with the ISP (PRDC) • PRDC to provider server space for video storage • PRDC will upload video to their servers
Lose control over data	Medium	High	• Establish local control policy & provider/partnership assessment process • Thorough planning over data collection & data management • Formal agreements for control • Establish monitoring system
Resistance from all levels – students, parents, staff	Medium	Medium	• Conduct education sessions • Professional development • Good communication systems • Regular reporting • Set up support systems • Provide performance summaries
Risks related to the increased access to sensitive information	Medium	High	• Secure computers, servers and wireless networks • Use anti-virus and anti-spyware protection, and firewalls • Regularly update software to the latest versions • Use data backups that include off-site or remote storage • Secure your passwords • Train staff in IT policies and procedures
Cyber-threats including malware	Low	High	• Security software, user training, and policies and procedures in order to safeguard our systems, networks, and information.
Commercial software providers are now integrating their products with social media sites, making risk mitigation very difficult.	Medium	Medium	• Try to avoid providers who integrate their products with social media. • Formal agreements to address issue
Failed Internal Processes – the failure of internal processes to perform as needed or expected. This comes from poor process design or execution, or faulty process controls.	Low	Medium	• Technology development team to develop processes • Stringent review process and reporting • Communication of internal processes • Education
Lack of technical competence	High	Medium	• Recruiting plans

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			• Internal building of capacity – short and long term • Use of experts • Outsourcing
Financial Costs too high	Medium	Medium	• Good planning and cost estimates • Budget reviews • Alternative revenue sources • Internal program reviews – looking for efficiencies

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Chapter 5: Governance

Introduction

Biigtigong Nishnaabeg have always governed ourselves in accordance with our traditional laws, customs, language, traditions, values, processes and structures. Over the years these have changed, mostly as a direct result of the impacts of colonization, where systems in direct contradiction of our cultural ways were imposed upon us. In response to centuries of culture and language loss and disconnection from our social and philosophical systems, we are committed to rebuild our contemporary governance systems that reflect our Nishnaabe culture.

Culture lies at the heart of governance. It forms the foundation and fosters the collectivism of a people through a shared sense of values, beliefs, meaning, knowledge systems, rules, purpose and vision. Through this shared culture, acquired over generations of our people, we are connected beyond the confines of our organization and the projects we create and implement. Our organization and project governance systems are an extension of and reflection of our Nishnaabe way of existing as individuals and as a collective.

The governance plan set out herein seeks to align cultural our Nishnaabe cultural practices and beliefs with modern practices, to facilitate a process that supports the implementation of the project and increases the success of achieving our outcomes. The governance structure has been established under the authority of Chief and Council. The structure was carefully designed to ensure it effectively facilitates the successful implementation of the proposal and the attained of the respective outcomes. It is based on Biigtigong's best practices and in alignment of its long-term vision in respect to governance.

According to the Project Management Institute (PMI), project governance is the elements and strategies that make a project successful. It is based upon the tailored needs of the community. The governance framework and strategies for this project are tailored to the community, rigorous, transparent, and will deliver value for money. The project team will ensure that the governance framework is implemented throughout the project and adjusted if deemed necessary.

Our Governance Structure

Biigtigong Community:

We are ultimately responsible to the members and residents of Biigtigong Nishnaabeg, including our ancestors and the seven generations to come. The people are the foundation of our governance structures. We are building upon a strong sense of community and a commitment to the vision for our children. Our governance structures and engagement strategies facilitates and builds strong connections with our community. Our Smart Cities Governance Plan makes community involvement and engagement a priority. We will create new opportunities for their involvement and build upon the existing systems. We ensure structures are in place to include our community throughout the lifecycles of projects and our long-term strategies. We are accountable to our members and their involvement is critical to ensuring we achieve our outcomes.

Chief and Council:

As the formal elected leadership of Biigtigong, this governing body is ultimately responsible for the overall affairs of the First Nation. Council has established governance systems that provide the necessary support and parameters for effective project governance systems. Our political and administrative functions are clearly defined and separated. Elected leadership is responsible for strategy and providing

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the systems, laws, policies, and other resources, to support successful implementation of projects. The governance model adopted for the Smart Cities project follows, aligns and enhances Biigtigong's Governance systems.

The Chief and Council through the authority of Biigtigong's Constitution will establish an Executive Board to oversee the Smart Cities Proposal. Additionally, two committees will be set up to support the proposal and the attainment of the outcomes. Both committees will play an integral role in achieving our outcomes and in creating high levels of accountability and involvement of our community. The following provides a brief overview of these three entities.

SC Executive Board

This board has been mandated as the governing body to oversee the implementation of our Smart Cities proposal. They will provide strategic direction to ensure the proposal continuously meets the needs of the community and achieves the identified outcomes. The Board will deliberate, make decisions, advise, provide strategic oversight, and to serve as the primary "advocate" for all the Smart Cities initiatives.

The Board is also responsible for the key business issues associated with the project. This includes approving the budgetary strategy, monitoring risks, quality and timelines, making policy, defining outcomes and deliverables, assessing change requests.

The Board will oversee the activities of the Aadsookaanan Reconstruction Committee and the Clan Engagement Committee. Both Committees were established to mitigate potential risks and create new opportunities. The Board will supervise and work the Smart Cities Project Lead throughout the project.

The Board reports directly to the Chief and Council and is subject to the regulations set out in the Terms of Reference for the Board and the Regulations Governing Committees. The Board and Council will collectively innovate on improving the reporting systems, promoting transparency, accountability and stakeholder engagement.

Due to the strategic importance of the proposal to the future of the community, the Chief will sit as the representative of the elected leadership. The Board will also be comprised of our CEO, Education Director and two youth. To increase success and mitigate risks, our Board will also include experts from the following fields: Nishnaabemwin (Language), Science, Technology, Engineering and Mathematics. We have five experts who have committed to sit on this Board.

Aadsookaanan Reconstruction Committee

This Committee will be part of the governance arm and will report directly to the SC Executive Board. Comprised of elders, traditional knowledge holders, and language carriers, youth and parents, this team will be responsible to assist in the reconstruction of our sacred stories, our Aadsookaanan.

Their primary role will be to provide guidance and direction to the technical and research group. They will have decision-making authority to approve the core aadsookaanan and forward the stories to the Immersion Team for video production. The Committee will also assist in mitigating risks that exist or may come to be. The primary risk management strategy includes engaging with the community and providing information and education.

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The Committee will operate according to its Terms of Reference and Biigtigong's Regulations Governing Committees. Following our cultural protocols governing elders and the transfer of knowledge is foundational to our governance plan.

Clan Engagement Committee

Engagement with all of our stakeholders is a critical factor to achieving our outcomes. In order to achieve high levels of meaningful engagement, we will employ our traditional clan system for this purpose. Each clan will select 2 representatives to sit on the Clan Engagement Committee. Clan leaders are responsible to report directly back to their respective clans, following the protocols established by the clans. Clan leaders hold the responsibility for two-way communication and reporting. This system allows for diverse engagement and facilitates deeper discussions and collaboration.

Inside the structure of the clan system are protocols that speak to the roles and responsibilities of individuals and the clans. Accountability, disclosure and transparency are inherent to the system. It also addresses ethics, communication, and codes of behavior, decision-making methods and dispute resolution. From an organizational perspective, the Clan Engagement Committee will report directly to and work closely with the SC Executive Board. The team will operate according its Terms of Reference and Biigtigong's Regulations Governing Committees.

Linkages with Existing Committees:

We will utilize existing governance structures to support the implementation of our proposal.

Youth Council

Our governance model will facilitate linkages between the SC Executive Board and our Youth Council, via the Board's two youth representatives. The Youth Council is an existing Committee that represents the interests of the youth and facilitates their involvement in the growth and development of their community. We will utilize this relationship to improve our connections with our youth and ensure we are meeting their needs.

Education Committee

The Education Committee is mandated as an advisory function in support of the Education Department. It is a primary means for parental involvement in education. We will utilize these resources, via the Education Director, to support the proposal's implementation, specifically within the Education Department. This provides another link to the stakeholders and ensures alignment with the Education strategy.

Finance and Audit Committee

The Finance and Audit Committee is responsible to review and make recommendations to Council on the financial administration matters of the Nation. The Finance and Audit Committee assists Council in fulfilling its oversight responsibilities for the financial reporting process, the system of Internal Control, the audit process, and the process for monitoring compliance with laws and regulations and the code of conduct.

The Executive Board will comply with the initiatives of the Finance and Audit Committee and the Director of Finance to ensure financial accountability and transparency. Biigtigong's Financial and Administrative Policies and Procedures govern the financial and human resource management of the project.

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Project Implementation Governance Systems

Some of the Smart Cities projects fall under the mandate of existing Departments. These projects shall become the responsibility of various Departments, such as, Education and will be administered in accordance with the existing governance and management systems of the First Nation. There are institutionalized and established systems that define roles and responsibilities, personnel matters, finance, performance management and evaluation, dispute resolution, risk management, reporting responsibilities, lines of authority and lines of command.

Senior Management Team

Inside of this system is an established Senior Management Team comprised of all Department and Service Directors. This body acts as the central coordinating entity for the First Nation that facilitates a holistic approach. A member of this team will be appointed to the SC Executive Board to ensure continuity, alignment and accountability. This individual will also act as a liaison between the Senior Management Team and the Smart Cities Executive Board. Respective Directors will obtain direction and provide input via this process and take the necessary steps for implementation within their departments.

Education Department

Our Education Department will be responsible for the implementation of the core components of our proposal, including the K-12 STEM program, Nishnaabemwin Immersion and the Meet-Up App. An organization review was conducted to determine the requirements for the integration of the new programs. Governance systems that define staffing requirements, organizational and reporting structures, roles and responsibilities, performance management, training and development, risk mitigation strategies, and financial requirements for the Smart Cities implementation are established. The education staff was involved throughout the entire review and development phase.

The implementation of the education components of the proposal will be under the direction and supervision of the Education Director. The Director will report on the activities and status of the projects to the Executive Board and the Project Lead. The reporting structure is designed to be flexible to allow for adaptive approaches to respond to changing needs. The Education Director will also provide updates and facilitate necessary action and support with the Senior Management Team.

Economic Development Department

This Department will be responsible for the implementation and management of our Youth-owned Student IT Business, the co-op placements and summer employment. Our team will work collectively with this department to create an innovative pathway for our high school students, providing an academic foundation supported by real-world work experiences. Our economic development department will build relationships with STEM based industries to assist in the co-op placements and summer employment. Our co-op program will be governed by the Ontario Ministry of Education standards and our own internal policies. Special considerations for individuals enrolled in the CompTIA A+ program will be built into our Summer Student Employment Policy, to support their path throughout high school.

Smart Cities Inter-departmental Program Committee

As part of our governance structure we will create an inter-departmental program committee, comprised of front line staff that are directly responsible to deliver specific programs. This team will consist of the SC Project Coordinator, Immersion Lead, STEM Lead, Co-op Lead, Meet-up App Lead and the Economic Development Manager. This group will work to strengthen collaboration across the team and integration of projects. They will review activity reports, monitor progress and outcomes, discuss administrative concerns, identify training needs, coordinate project management, identify risks and

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solutions and create substantial working relationships. The Committee will report to the Education Director. The Education Direction will bring all appropriate matters to the attention of the Senior Management Team and/or Executive Board.

Governance Principles

We will utilize our traditional governance principles, as set out in our Aadsookaanan, as embedded in our language and ceremonies, as practiced within our operations and commit to gaining a greater understanding of our traditional ways and establishing more effective and legitimate governance systems. Our principles support processes that are consensus oriented, participatory and inclusive, transparent, accountable, long-term considerations, responsive to change, flat and non-hierarchical, and based on relationships. We will adhere to the governance principles identified in Biigtigong's Constitution, laws, policies, procedures, informal protocols and cultural practices.

Decision-making

Our cultural practices utilize a consensus-based decision-making model. As an approach to fostering collaboration, consensus-based decision-making provides every individual equal access and responsibility to the process. This model facilitates improved decisions due to the stakeholders claiming responsibility by providing input in keeping with the best interests of the seven generations to come. It fosters increased interpersonal connections and relationships, resulting in greater sense of cohesion and commitment to the goals and vision. Utilizing our cultural practices and embedding our values inside of our governance system enhances the project and its successful implementation.

Part of our decision-making model includes mechanisms to deal with conflicts and disputes. We utilize a restorative justice model as our dispute resolution process. Based on cultural values our systems aim to restore harmony, balance and build relationships. We will utilize Biigtigong's processes to address potential conflicts with or amongst our stakeholders.

Human Resource Management

Human Resource management is coordinated by Biigtigong's Finance and Administration Department. Policies and procedures are in place to govern hiring and recruiting, training and development, travel, honoraria, salary, compensation, performance appraisals, employee benefits, health and safety, contracts, confidentiality, code of ethics, conflict of interest, dispute resolution, employee relations and well-being. This centralized system promotes fairness, consistency, transparency and accountability. All staffing and awarding of contracts associated with the Smart Cities proposal will be subject to the existing policies of the First Nation.

Change Management

Our culture acknowledges the world is in constant flux and change; we are in a perpetual state of responding to this change. The concepts of renewal and transformation are inherent to how we interact with the inter-connected world. These beliefs are reflected in our governance systems. We adopt a learning environment that fosters change and utilize iterative management practices to ensure on-going alignment between our outcomes and the needs of our stakeholders. We offer employee assistance programs to assist in change management. Additionally, our Social Services Team provides supports to assist individuals, families and teams, with any issues that arise as a result of change. We also rely on our cultural ceremonial practices to assist in our change management efforts.

Risk Management

Our goal is to create an organization culture where risk identification and management become part of everyday life. Although it is important to conduct a risk assessment at the onset of a project, it is equally

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important to ensure risk management activities are performed, recorded and monitored throughout the lifecycle of the project. Our risk management strategies aim to accomplish this.

For this project, we will utilize a framework that provides for a process for risk identification, risk analysis, risk response planning, monitoring, controlling and reporting. For each major risk that is to be mitigated or that is accepted, a course of action will be outlined for the event that the risk does materialize in order to minimize its impact. Monitoring and reporting mechanisms will be built into all levels of governance and project implementation. Ultimately, the risk management plan is the responsibility of the Executive Board.

Communication Plan

Communication is the key to a successful project. Our communication plan identifies key stakeholder and avenue for the delivery of pertinent information. Information will be delivered to all stakeholders in a timely fashion. Our engagement plan provides more details on how we plan to build strong communication with our stakeholders.

Control Process

The project team will continuously monitor the project against established timeline and metrics. This will ensure that the project is in accordance will budget and timeline and that deviations are remedied. Our internal systems of control are well defined and tested. We have made some adjustments to ensure our Smart Cities implementation is done so successfully.

Partnerships

Introduction

The goals of our Smart Cities proposal are ambitious and require a collaborative approach to make them achievable. Partnership opportunities exist across many sectors and include individuals, businesses, education institutions, governments and community organizations. Partnerships are a strategic process and our approach to partnerships begins at home by creating a solid foundation that we can build upon. We want Smart Cities to live beyond the life of the proposal and become part of how Biigtigong exists.

Our Internal Partnerships

The impacts of our proposal outcomes will create substantial change that extends past the individual students and into the social and economic fabric of the community. Preparing our children for the digital world also includes preparing our organizations and community. This is why our membership is best served by aligning our different departments and related organizations. These alliances require deep interpersonal connections and appropriate structures and systems in order to yield the highest benefits.

Our internal partnerships are living systems that evolve progressively in response to the changing environment and the needs of our membership. Building upon and utilizing our internal resources and developing our capacity are necessary to achieve long-term sustainability. Collaboration between our service departments and community owned organizations are critical to achieving success.

Our focus, the central point of everything, is our children and this is what brings us together and keeps us together. The elders always remind us that it is our responsibility to keep our children in the center of everything. Sharing a common vision and purpose is what binds successful partnerships. Our Smart Cities proposal is attached to and supports Biigtigong's bigger vision of Nation building.

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Biigtigong's Service Departments

Our Smart Cities proposal development team, which consisted of two members of the Senior Management Team and the Chief, approached the proposal implementation phase as a collective effort of our entire team. The goals of the proposal align with the overall goals of the organization, making it easy to establish collaboration and project partnerships. We entered into collaboration agreements with our service departments. The purpose of these agreements is to demonstrate that the proposal is supported by the entire organization.

Our internal partnerships are governed by the structures, regulations, practices and historical relationships that exist within the organization. We have established and proven frameworks that we utilize for our projects. These frameworks address general project management requirements, such as, managing risks, finances and resources, quality assurance and performance management, human resource and capacity development, reporting and accountability and team development. Our implementation plan is build upon our assessment of our internal capacities, readiness and resources.

To ensure success, our implementation plan allocates specific tasks to respective departments who have a related mandate. For example, our Sustainable Development Department who is responsible for economic development, employment and training, will be responsible for the establishment of the high school reBOOT IT business, co-op placements and summer employment. While our education department will be responsible for the academic portions of the co-op high school program. Such partnerships allow us to extend the reach of our project goals and build the foundations for long-term sustainability.

The community retains control over sensitive and personal data. We already have established policies and systems that manage and control data collection. We do not want to re-invent systems but rather utilize existing resources and help make necessary improvements where we can.

The initial commitments from our service departments are identified in the collaboration agreements attached. These will be continuously reviewed, monitored and developed to ensure the best possible strategies are collectively in implemented to better serve our membership. Our Smart Cities proposal has provided another rallying point to collectively strategize in bringing together our efforts to innovate and make meaningful lasting change and improvements.

Our External Partnerships

Two of our main external partnerships are with independent, but related entities of Biigtigong. Pic River Development Corporation is the Internet Service Provider in the community and will provide services for the off-ramping, uploading, downloading and backup storage of our videos at no cost. They also made a financial commitment to support the project implementation. Anishinabek Employment and Training Services is an entity that provides employment support and training services on behalf of 9 First Nations. A three-year financial contribution has been made to assist in the development of the CompTIA A+ and reBOOT co-op education program and the summer student employment portion. Biigtigong has existing agreements with both entities that defines the relationship, mandate, governance structures and other areas. The risks associated with these partnerships are extremely low and mitigation strategies to address the risks are already in place.

Biigtigong has many business partners and professional relationships. Part of our business strategy is to develop mutually beneficial partnerships that create value. We seek to be a 'partner of choice' and have a history of successful partnerships. Letters of support from some of our business partners are attached to this proposal. We have not entered into any formal partnership agreements but we will explore the

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options when needed. At which time we will enter into formal agreements that define the details of the partnership.

Our Service Partnerships

Our Smart Cities team has enlisted the help of two organizations who bring value to achieving our set outcomes. Memorandums of Understanding have been signed with ICTC and reBOOT Canada and provide the details of the partnership. Both entities are assisting us with the implementation of our K-12 STEM programs. Our projects share common visions and provide services that complement each other and provide a good fit. We have developed excellent working relationships and have created a common path and are equally excited to embark on our journey together.

Anishinabek Education System

23 First Nations are part of an education self-government agreement with Canada and Ontario, forming the Anishinabek Education System. The participating First Nations under the Anishinabek Education System will enact education laws that govern the Anishinabek Education System and the delivery of programs and services. Each participating First Nation has law-making power and authority over education from JK to Grade 12 on reserve. Participating First Nations will also establish and maintain system-wide education standards that support the transfer of Anishinabek students between the Anishinabek Education System schools and the provincial education system schools.

AES is in its development stage and in the process of getting established and operational. The Board has provided a letter of support of our proposal and we will explore options on how our proposal implementation can assist the other 22 First Nations. AES is an opportunity for First Nations to collectively work together to address the education needs of our children. We expect that as AES develops that we will create innovative approaches to improving the lives of our children.

Summary of Partnership Agreements

Source	Type	Notes
Internal Collaborative Partnerships		
Children & Family Learning Centre	Collaborative Service Agreement	Biigtigong Service Department
Health & Social Services	Collaborative Service Agreement	Biigtigong Service Department
Sustainable Development	Collaborative Service Agreement	Biigtigong Service Department
Capital-Housing	Collaborative Service Agreement	Biigtigong Service Department
Finance & Administration	Collaborative Service Agreement	Biigtigong Service Department
Education	Collaborative Service Agreement	Biigtigong Service Department
Service Partnership Agreements		
Pic River Development Corporation	Memorandum of Understanding	Biigtigong Non-Profit Corporation
reBOOT Canada	Memorandum of Understanding	New Partner
Information And Communications Technology Council (ICTC)	Letter of Support Memorandum of Understanding (waiting on approval)	New Partner
Anishinabek Employment and Training Services (serves 9 First Nations)	Letter of Support – financial commitment	Aboriginal Skills Employment and Training Strategy
Industry Support		
S. Burnett & Associates	Letter of Support	Business Relationship/Partner
Anishinabek Education Services (23 First Nations)	Letter of support	Anishinabek Nation Education self-government agreement
Nishnawbe-Aski Development Fund (NADF)	Letter of Support	Business Relationship/Partner
AV Terrace Bay Woodlands	Letter of Support	Business Relationship/Partner
Barrick Hemlo	Letter of Support	Business Relationship/Partner
BDO	Letter of Support	Business Relationship/Partner

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CRC Communications	Letter of Support	Business Relationship/Partner
First General Services	Letter of Support	Business Relationship/Partner
Supercom Industries	Letter of Support	Business Relationship/Partner
Chant	Letter of Support	Business Relationship/Partner
Biigtigong Dbenjgan	Letter of Support	Business Relationship/Partner
BMC Contracting	Letter of Support	Business Relationship/Partner
BMO Bank of Montreal	Letter of Support	Business Relationship/Partner
DJB Consulting	Letter of Support	Business Relationship/Partner
FP Innovations	Letter of Support	Business Relationship/Partner
GMS Camps & Catering	Letter of Support	Business Relationship/Partner
Hydro One Networks Inc.	Letter of Support	Business Relationship/Partner
Mkwa Timber GP	Letter of Support	Business Relationship/Partner
Ontario Waterpower Association	Letter of Support	Business Relationship/Partner
Royal Bank of Canada	Letter of Support	Business Relationship/Partner
TBT Engineering	Letter of Support	Business Relationship/Partner
** Evidence and details of partnerships are included in the Appendices.		

Governance & Partnership Risks and Mitigation Strategies

Risk	Likelihood	Impact	Risk Management Approach/Mitigating Actions
Change in partners' involvement or withdrawal.	Low	High	• Build Relationships • Formal agreements • Identify alternative strategies • Continually monitor risk
Admission of new partners.	High	Medium	• Admission mechanisms • Needs based; team approval process • References – due diligence
Conflict of Interest	Low	Medium	• Build strong communication among the partners • Maximum transparency • Implement Conflict of Interest Policy
Potential inequalities in partners' resources and expertise determine their relative influence in the partnership's decision making.	Medium	Medium	• Focus on consensus based decision making • Address in formal agreements • Build relationships • Access to dispute resolution process • Involve experts on Executive Board
Poorly defined shared vision and objectives.	Low	Medium	• Develop shared vision with clearly defined objectives • Link corporate objectives/organizational objectives to the project objectives • Training and Education sessions • Annual reviews
Partners do not meet performance targets in a satisfactory or timely way.	Low	High	• Develop an agreed upon Performance Management framework • Conflict management/resolution procedures • Encourage joint ownership of problems & solutions • Relationship building
Failure to engage key stakeholders in meaningful ways.	Low	Medium	• Awareness & education of engagement strategy • Communication strategy • Performance measurements inclusion • Evaluation strategy

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Failure of partner to comply with relevant laws and regulations.	Low	Low	• Identification & education of laws & regulations • Dispute resolution process • Develop safeguards throughout project
Lack of understanding with local culture.	Medium	Medium	• Cultural awareness training • Provide explanations – no assumptions • Dispute resolution
Financial risks No strategic approach to issues of risk, costs and benefits	Medium	Medium	• Define and agree with approach to dealing with costs and benefits of the partnership. • Continuous monitoring & reporting • Utilize Finance Department & Finance Committee
Loss of autonomy	Low	High	• Rigorous selection of partners • Clear agreements
Lack of capacity, skills, knowledge and experience	Medium	High	• External Recruitment Plan • Local training & development plan • Outsourcing and Contracting Options
Poor internal & external communication.	Low	Medium	• Establish communication plan & review • Regular meetings • Structured reports • Use of collaboration tools

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Chapter 6: Community Engagement Plan

Part 1: Our Approach to Engagement

Our engagement plan is built upon our fundamental belief as Nishnaabeg that everything is inter-related and inter-connected. We view the world as being in constant motion, made up of complex networks and long-term sustaining relationships. We understand the importance of developing and maintaining relationships and the goal of keeping balance and harmony. As a relationship based system, the principle of inclusion is foundational to how we live our lives. Hence, our approach to engagement is inherently inclusive in nature and facilitates high degrees of community participation in meaningful ways.

Our engagement plan, not only facilitates the involvement of our stakeholders, but it does so in a manner that supports the revitalization of our traditional ways in a modern world. Our engagement plan facilitates the coming together for a common vision and purpose. It supports the continuous development as individuals and as a community, as it affirms our common values, builds trust, strengthens relationships, fosters responsibility and accountability and facilitates community ownership.

Purpose of Engagement:

The overall purpose of engagement is to create opportunities for our children, youth, parents, grandparents, aunts, uncles and all Biigtigong members, to embrace their responsibility for the well being of our community and future generations and become actively involved in creating a better world.

Engagement Objectives:

1. To empower those affected by this proposal to be involved in the decision-making process and the creation of solutions to challenges and opportunities that are specific to stakeholder needs.
2. To ensure the engagement processes are meaningful and seek out real contributions that influence the project design and implementation.
3. To facilitate a learning environment, where the transfer of knowledge and skills encompasses everyone who is impacted by the project.
4. To utilize cultural practices to ensure successful engagement and facilitate community pride.
5. To document and share our experiences with engagement, in order to assist in making this project more scalable and replicable.

Engagement Principles:

The following guiding principles form the basis of our engagement process and approach to ensure high-quality collaboration and meaningful active participation.

1. **7th Generation Principle:** We are responsible for the seven generations to come and to the seven generations that came before us. We will move forward embracing our past and future generations and remember the long-term impacts of our decisions.
2. **All my Relations**: Our way of life is centered on the belief that we are all related and connected. Every decision impacts everything. We will seek out holistic approaches that honour all life and our complex networks.
3. **Relationships:** Developing and maintaining relationships with all life is central to our Nishnaabe way of being, bringing rights, obligations and responsibilities that extend beyond self. We act accordingly, always striving for a state balance and harmony, as we work collectively towards our vision
4. **Renewal and Transformation:** The notions of renewal and embracing change are inherent in our worldview, as we view the world as in a state of constant flux and change. We will utilize

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approaches that respond to continuous change and implement on-going evaluation to ensure we are meeting our goals and the needs of the community.

5. **Process Focused:** Comprised of approximately 70% verbs, the importance of process and actions are embedded in our language. Our approaches will be action-orientated, focusing not only on achieving results, but also on the journey and lessons that our journeys bring.
6. **Natural Laws:** We learn about what our behaviour should be by observing Mother Earth and respecting the natural laws.

Stakeholder Identification

This proposal will change the essence of the social fabric of the community. From previous engagement experiences on other projects, we understand the importance of including the diverse groups that will be impacted and/or could impact the project. We understand that this journey, especially the reclamation of our language and aadsookaanan, will potentially stir emotions resulting from historical impacts from cultural genocide. We further understand, that it is necessary to walk through these hurts together in order to move forward, heal and reclaim our culture and identity. This proposal required the input of everyone, as it provided another opportunity to build stronger individuals, families, community and a Nation.

In identifying our stakeholders, we considered those who would be immediately impacted and those impacted according to our 7th generation principle. Various target groups were identified and strategies established to facilitate meaningful engagement. Evaluations of these approaches were conducted and necessary changes were implemented and/or noted to improve outcomes. As we move forward from development to implementation, we remain committed to developing effective engagement processes that build upon best-practices while creating new and innovative ways of engagement.

Part II: Our Engagement To Date

Efforts to ensure participation amongst the diverse groups within the community have provided valuable insights that have significantly improved the final proposal. Our engagement processes to date have resulted in obtaining a clearer understanding of the challenges and opportunities that exist or could potentially exist throughout the life of the proposal implementation stage and beyond. It facilitated the development of creative mitigation risk strategies and creative means to grab the opportunities. Our engagement process has led to an excitement; it has provided a central rallying point. The following provides a list of primary stakeholders engaged to date, the methods used for engagement and the insights gained from the engagement that shaped our proposal.

Formal Leadership

Engagement with our elected leadership has reiterated their long-term commitment to the goals and the expected outcomes of this proposal. Council echoed the need to build everything in a manner that will lead to long-term sustainability. In order to ensure long-term success, the spirit of the proposal must become part of the DNA of the entire organization and community. Due to the nature and outcomes of the proposal, the entire organization and community, must strategically align resources in the collective pursuit of our vision.

Council understood the need to build STEM knowledge in order for the community to participate in the rapidly changing world. Additionally, that the creation of children who understand their traditional language, for the first time in centuries, will profoundly change the fabric of the community and our institutions. Council also restated their excitement that our proposal will impact people beyond our

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community. Direction was provided to our Senior Management Team to ensure our strategies align and support the specific goals and outcomes of the Smart Cities proposal.

Our Senior Management Team is constantly creating, evaluating and reimaging our vision, our strategies, successes and failures, in our efforts to build our Nation. Working towards a common vision, our education, health, social services, lands and resources, governance, economic development, housing, and public works team, collectively and strategically aim to address the needs of our community. Our engagement with Senior Managers allowed us to work towards a common vision and develop mutually supportive and attainable goals.

Language and aadsookaanan reconstruction and revitalization is an organization wide goal and will impact our existing service delivery models. For example, upon the completion of the aadsookaanan reconstruction work, our Social and Health Department, will utilize this work to reconstruct our rites of passage and develop a service model based on the rites of passage. Another example is the re-visioning of our dispute resolution policy and the alignment with the ancient teachings contained in our aadsookaanan. A review of our Human Resource Strategy will be conducted in light of the availability of immersion video that will create understanders.

As for STEM, our departments will be providing support, in terms of placements, special speakers, student co-op work opportunities, and STEM related summer employment. Our Senior Management Team are committed to creating the necessary supports, as per the findings of our on-going evaluation and project implementation, to ensure successful attainment of our goals.

The primary engagement tool we utilized with leadership was holding face-to-face meetings both collectively and individually. This method was selected in order to facilitate critical thinking and extensive discussion. Leadership was also represented at all of our other stakeholder engagement sessions. On-going engagement with this particular group is of extreme importance to the success and continuation and growth of our Smart Cities proposal.

Continued engagement will occur through the existing structures that will facilitate on-going connections between the proposal implementation team and the leadership. Senior Management will be responsible to engage their respective staff members. Regular meetings will occur throughout the life of the project, in addition to regular reporting and evaluation. The governing team responsible for the Smart Cities project will have a representative from Council and Senior Management appointed to ensure successful implementation and alignment of goals.

Biigtigong Aadsookaanan Group and Elders

Our elders and traditional knowledge holders are considered major stakeholders in this project. Following our cultural protocols, these groups have been involved in the planning and development of our proposal, including our initial application. Our approach to engagement with our elders usually occurred in informal settings, not in a boardroom. We respected their approach in transferring knowledge and providing direction through the use of stories and personal accounts of life experiences. Individuals from this particular group have directly experienced the affects of residential and day school systems. They are able to speak first hand regarding the loss of language, the loss of their stories and methods of transferring cultural knowledge and the trials this has caused in their lives and those of their family. They are motivated to create opportunities to reconcile the impacts from this part of our history.

Through our engagement processes, these stakeholders provided strong support for the use of technology in the creation of understanders of Nishnaabemwin (our language) and the transfer of traditional

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knowledge contained in our Aadsookaanan (sacred stories). Many understood the power of technology due to their involvement in our language reconstruction and documentation project. From first hand experience, they saw the data that everyone contributed and the research data, along with technology, successfully aid in reconstructing our language. Most of our elders and knowledge keepers realize that language revitalization in our community is impossible without the use of technology. Additionally, they felt that making our language and stories available on-line, was the best means to reach our youth. With only one proficient speaker left in our community, taking the data available through our language and making this accessible for everyone, forever, and utilizing immersion, on-line, provided hope and reconciliation.

They also asserted the importance of having our youth and our elders/knowledge keepers interact in real-life experiences. Our elders reminded us that our way of life is tied inherently to the land and more to a specific place. In order for us to transform our youth into better-educated, more-employable, better-grounded and more holistically Nishnaabe, we must keep them connected to their territory and the teachings that can only come from intimate relationships with the trees, birds, fish, wind, rain, rocks and every part of existence. They stressed the importance of our land-based curriculum and the need to build their relationships with Mother Earth.

The primary engagement tool used to obtain input from this target group was the use of face-to-face informal meetings. We followed cultural protocols, with the passing of tobacco and observed the traditional methods of knowledge transmission. We smudged, sang, feasted, told stories, laughed, cried, talked, listened, remembered our ancestors, sat in silence, and together made decisions in the best interest of seven generations.

Our elders and traditional knowledge will continue to play an integral part of our Smart Cities proposal implementation. The role our elders play in our world is very explicit as defined by our cultural protocols. We are responsible to acknowledge their role and facilitate the inter-generational transfer of knowledge, in a culturally appropriate manner. Our proposal sets out formal and informal on-going space for the involvement of our elders and knowledge keepers. Cultural norms dictate that we are accountable to our elders and as just this guarantees that they will be meaningfully involved in this proposal.

Biigtigong Youth

Our youth are the center of this proposal and are the main beneficiaries and reasons for this proposal. Part of our engagement strategy for this group, included the examination of results and other engagement sessions held by other community projects. We utilized this information to augment the information we obtained through our engagement sessions.

Through surveys and personal interviews with our youth, they expressed the need to be better prepared for the technological world. Additionally, they felt it was important that having a strong sense of their Nishnaabe identity was essential to their success. Not having been exposed to their traditional language and what it contains, our youth do not understand the profound sense of loss that our culture has suffered or the depth of the benefits one can receive from acquiring their language. Our initial application failed to identify this as a potential drawback to achieving our outcomes. This is addressed in our final proposal by creating a series of videos that provides an inside look at the philosophy embedded in the language and how it expresses our unique worldview. It is our intention that these videos, along with teachings from our elders, will provide our youth and other community members with the motivation to begin their language acquisition journey.

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We engaged the youth through some of their established groups. Additionally, we hosted special events at their local high school, sponsored community events, conducted a youth survey, and talked to them in various public functions and locations. Several new initiatives are currently underway with our departments that aim to increase youth involvement. Our Smart Cities team have provided input into the establishment of these new initiatives and will utilise these structures to increase youth engagement. They new approaches are youth-driven.

Parents

Projects aimed at our children will be more successful with the support of their parents. Our parental engagement findings showed an overall support of the proposal. Parents understood the importance of preparing our children and youth for the technological world. Additionally, they acknowledged the importance of language, culture and land to identity and how this was important to living good lives.

One of the biggest impacts resulting from our consultations with parents was their personal fear in not having knowledge of STEM or the language. This translated into building into our proposal strategies to help educate our parents and provide resources on how they can support their children's language acquisition and STEM learning journeys. Including supports for parents has now become an important addition to our proposal. We will incorporate strategies that facilitate family learning. Overall, the parents were excited about the new possibilities for their children and several thought perhaps they should go back to kindergarten.

Parents understood that this proposal would produce understanders of the language. They wanted reassurance that the resources necessary to move from being an understander to becoming a speaker will be available. Our 2019 survey and 2006 survey clearly state that language revitalization is a community priority and creating speakers is our ultimate goal.

We utilized surveys, community meetings, and small group discussions, as the means to obtain parental engagement. Our education staff took opportunities inside their system to engage the parents and introduce them to STEM. We have strengthened our strategies to encourage and empower our parents as they support their children's education journey. Continued parental engagement throughout the proposal implementation is important to achieving the outcomes for our children.

Biigtigong Education Staff

Biigtigong has a well-established, creative and results-driven Education team. Their participation in the development of the proposal has been important and has resulted in substantial contributions to ensuring the successful implementation of our proposal. They have identified solutions to potential problems and have substantially improved the quality of the proposal.

They have been extensively involved throughout the entire process, from visioning, to curriculum reviews and development, education philosophy and pedagogy reviews, assessment and evaluation development, privacy and data, student needs and support, student learning styles, immersion video production, professional development and capacity building, co-operative education models and re-imaging a new education model. The application of the resources developed through this proposal will be subject to the rules and regulations of the Education Department. The education department will maintain responsibility for the monitoring of individual student assessments and the overall education mandate.

Through pilot projects and professional development initiatives, the staff had the opportunity to facilitate student learning in the area of technology and engineering. This was particularly challenging, as the

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teachers had little to no knowledge of either fields or experience using on-line resources in these fields. This work resulted in wonderful lessons but the most important take away is the creation of a team excited to take on the world of technology, engineering and language acquisition. Our education department and our Smart Cities team has developed a training strategy to support teachers with STEM, language and and blended learning education.

One of the major changes resulting from the engagement with the education staff relates directly to our initial goals in the secondary school program. The staff highlighted the limitations of secondary level courses as it related to our initial vision. As a result, we had to go back to the drawing board and find other ways to implement our vision. This turned out to be such a wonderful problem, which initially seemed insurmountable. This led to the development of a much more supported and comprehensive high-school program. It now provides high-school credits, real technology and engineering co-ops, summer internships and employment, youth owned and run business, career support and mentorship.

Our engagement with our education staff has been extensive and will continue to be so. We have utilized surveys, focus group discussions, small group discussions, pilot projects, training sessions, staff meetings, on-line resources, collaborative tools, and cultural events to engage our education team. We have created an organizational culture that supports and empowers our staff. The success of our Smart Cities proposal is increased by meaningful engagement and empowerment of our Education team.

Off-Reserve Members

The Smart Cities proposal provides an opportunity to strengthen the community bonds between on-reserve and off-reserve members. Through our on-line platform, off-reserve members will have the opportunity to access important community data relating to their language and aadsookaanan. Additionally, they will have access to any programs developed by the community that support STEM on-line. The meet-up-app will also help facilitate opportunities to return home to their traditional territory and participate in person with the community.

Our off-reserve members indicated support for the proposal goals and were excited about the opportunity to acquire their language from the comforts of their home. Engagement results reiterated the need to more effectively utilize technology to build stronger relationships and inclusion of off-reserve members into the building of our Nation.

Our engagement with off-reserve members included a survey, a meeting in Thunder Bay, availability of live-streamed community meetings, conference call meetings and web-site information. Our plan moving forward includes strategies to increase off-reserve participation and engagement.

Community Members at-large

Various engagement activities were held for the general population. These events included, luncheon talks, large community presentations, small group sessions, social events, survey, live-streamed community meetings, newsletters, web sites, email and social media. We received tremendous support for the project through the high levels of participation in the engagement sessions. Our general sessions were well attended and our survey return rate was high. The responses shaped our proposal by confirming we are on the right path and the community is behind the goals set forth in our proposal. Community support is very important to the successful implementation of our proposal. It does take a whole community to raise a child.

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STEM Professionals and Academia

In order to ensure our proposal is academically feasible and provides a solid foundation for entry into related post-secondary programs or employment fields, we engaged various STEM professionals from the business and academic sectors. The information and insights provided by this group has significantly impacted our proposal. They played instrumental roles in selecting the curriculum and developing a sequencing of skills and knowledge. Their expertise provided us with the guidance to develop a high level K-12 STEM program, with ambitious and achievable goals. Their continued involvement in the project will ensure our programs meet the needs of our students and the ever-changing needs of the industry.

Engagement Tools

A variety of methods were used during the proposal development stage to achieve high participation rates amongst the stakeholders. Upon the completion of stakeholder analysis, where a careful review of the potential risks, interests and benefits were identified, engagement strategies were designed to suit the specifics of each group. Engagement tools were purposely selected and customized for each of our stakeholder groups. In addition to selecting appropriate tools, the presentation itself was customized for the specific audiences.

Individuals who had experience working with each of the stakeholder groups were invited to assist in the design and the development of a best-suited approach to the consultations. Involving these individuals increased our efforts of engagement to produce meaningful results and strong community buy-in and support. A list of tools used is attached as Appendix Z.

Summary of Engagement to-date

Our engagement plans to date has resulted in the successful participation from our residents and the diverse stakeholders of the project. We believe our processes were meaningful and facilitated honest and open discussions. As a community, we explored the potential barriers and risks to our success and found creative solutions to address them. We embraced the opportunities and strategically developed a difficult but implementable proposal that will make profound impacts forever. We understand the importance of engagement and make this foundational to how we build our Nation.

Part III: Engagement During Implementation

We are building upon the successes of our engagement during the final proposal development phase. Our plans for engagement during the implementation stage are aimed to foster high levels of community engagement from the diverse stakeholders. The engagement processes are intended to ensure the needs of the community are being met and the program meets its expected outcomes. The engagement process will foster community development, inclusion and provide a rallying point for members to make meaningful contributions to helping transform our youth into better educated, more employable, better grounded and more holistically Nishnaabe people.

Formal Leadership

The following will be implemented to ensure meaningful and continued engagement with our formal leaders to support the attainment of the proposal outcomes:

1. Smart Cities Executive Board: The Chief and Council and the Senior Management Team will each have a representative on the Smart Cities Executive Board. Each will be coordinate engagement with their respective group.
2. Senior Management Team: An Executive Board representative will participate in quarterly meetings.

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3. Bi-monthly report: A video report will be made available to provide education, accountability and foster engagement on the project.
4. Annual Report: Produce and annual report to Council, Senior Management and Community.
5. Ceremony: Elders will be invited to an annual ceremony where we honour the goals of our proposal and ask for help and guidance from our ancestors.

Elders

The following will be implemented to ensure meaningful and continued engagement with our elders to support the attainment of the proposal outcomes:

1. Aadsookaanan Working Group: This group is comprised of elders, language carriers, traditional knowledge holders, youth, parents and technical personnel. They will work collectively with the aadsookaanan research and reconstruction team. They will act as the advisory body and assist in the decision-making process regarding aadsookaanan reconstruction. Additionally, they will report to the Executive Board who is responsible for the overall proposal. This group will remain in affect for the entire implementation stage and will meet no less than quarterly and more frequently when required. The group will coordinate community engagement sessions regarding the aadsookaanan project to keep the community informed and involved.
2. 50+ Elders Group, TEK Working Group, Place-Name Reclamation Working Group: Bi-annual engagement events will be held specifically with each of these existing community elder groups.
3. Pop-Up Engagement Sessions: We will host at minimum one pop-up Smart Cities fun and informative pop-up engagement session. These sessions will be held in support of existing annual community events, such as, moose-camp, addictions awareness week, fish-camp.
4. Ceremony: Elders will be invited to an annual ceremony where we honour the goals of our proposal and ask for help and guidance from our ancestors.
5. Bi-monthly Report: A video report will be made available to provide education, accountability and foster engagement on the project.
6. Annual Report: Produce and annual report to Council, Senior Management and Community.

Biigtigong Youth

The following will be implemented to ensure meaningful and continued engagement with our youth to support the attainment of the proposal outcomes:

1. Executive Board Seats: Two seats on the Executive Board will be reserved for youth representation. The seats will hold the same responsibility and influence as all other seats on the committee. The youth representatives will be responsible for coordinating the youth engagement strategies.
2. Biigtigong Youth Council: We will utilize the Youth Council to assist in the coordination of joint initiatives aimed at youth engagement.
3. In-school Engagement: We will host one in-school engagement session per semester.
4. Pop-Up Engagement Sessions: We will host at minimum one pop-up Smart Cities fun and informative pop-up engagement session. These sessions will be held in support of existing annual community events, such as, moose-camp, addictions awareness week, fish-camp.
5. Formal Evaluation: Our youth will be involved in the evaluation of the proposal activities and in the development of strategies to strengthen the program.
6. Celebration of Achievements: A celebration of student achievements as they r elated to the outcomes of this project will be planned each year.
7. Bi-monthly report: A video report will be made available to provide education, accountability and foster engagement on the project.
8. Annual Report: Produce and annual report to Council, Senior Management and Community.

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Parents

The following will be implemented to ensure meaningful and continued engagement with our parents to support the attainment of the proposal outcomes:

1. Education Committee: An Executive Board member will work with the Education Committee to engage and inform parents.
2. Child and Family Learning Centre Parent Committee: An Executive Board member will attend 1 parent meeting per year, or as requested.
3. Existing In-School Parent Engagement Activities: Parents will be engaged through parent-teacher interviews, open-houses, progress reports, on-line media and other in-school engagement processes.
4. Parent and Student Cohort Support Program: A special program will be set up for the parents and students for the 2019 cohort moving into the CompTIA A+ program. This program will provide various support services for the duration of the program. Parents will have an opportunity to help adapt the program in order to better serve youth success.
5. On-line workshops for parents: A series of on-line interactive workshops will be held for parents to help them engage in the learning journey of their children.
6. Formal Evaluation: Our parents will be involved in the evaluation of the proposal activities and in the development of strategies to strengthen the program
7. Bi-monthly report: A video report will be made available to provide education, accountability and foster engagement on the project.
8. Annual Report: Produce and annual report to Council, Senior Management and Community.
9. Pop-up Engagement Session: We will host at minimum one pop-up Smart Cities fun and informative pop-up engagement session. These sessions will be held in support of existing annual community events, such as, moose-camp, addictions awareness week, fish-camp.

Off-reserve Members

The following will be implemented to ensure meaningful and continued engagement with our off-reserve members to support the attainment of the proposal outcomes:

1. Off-reserve meetings: A minimum of one in person meeting will occur with off-reserve members.
2. Live-stream video: All community meetings will be live-streamed to encourage off-reserve members.
3. Webinars: 2 Webinars will be held annually for post-secondary students and off-reserve members.
4. Formal Evaluation: Our youth will be involved in the evaluation of the proposal activities and in the development of strategies to strengthen the program
5. Bi-monthly report: A video report will be made available to provide education, accountability and foster engagement on the project.
6. Annual Report: Produce and annual report to Council, Senior Management and Community.

Community at large

The following will be implemented to ensure meaningful and continued engagement with our community to support the attainment of the proposal outcomes:

1. Community Meeting: A minimum of one in person meeting will occur with on-reserve members.
2. Live-stream video: All community meetings will be live-streamed to encourage off-reserve members.
3. Nishnaabe Clan System: A new engagement system based on our clan system will be introduced for the first time. This is an extensive engagement process that is designed to include all sectors of the community. This system will be used as one of our primary methods of community engagement.

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4. Formal Evaluation: Our youth will be involved in the evaluation of the proposal activities and in the development of strategies to strengthen the program
5. Bi-monthly report: A video report will be made available to provide education, accountability and foster engagement on the project.
6. Annual Report: Produce and annual report to Council, Senior Management and Community.

Nishnaabe Clan System

Reconstruction and reclamation of our ancient Nishnaabe ways is a central to our vision. In keeping with the spirit of our vision, we intend to utilize our traditional clan system as the primary method to our engagement strategy. The clan system is built upon principles that are foundational to our world-view and philosophical understanding of our world. These principles capture cultural values, such as, non-hierarchical structures, cooperation, collaboration, reciprocity, communal living and promotes the importance of relationships.

Our clan systems are reflective our cultural structures that emerges from our relationships with the land and a naturalistic cosmology. We look to the natural world and the laws that exist on the Earth, as our guiding principles for the development of our systems and structures. Our clan systems consist of seven primary clans: Loon, Crane, Fish, Bird, Bear, Marten and Deer, each having several sub-clans. Each clan has adopted a spirit animal as their totem and this animal is a symbol of how the members of each clan should conduct themselves and relate to the world.

This system organizes work and establishes responsibilities of individuals and the collective. Each clan holds specific duties and responsibilities to take care of the physical, mental, emotional and spiritual needs of the community. Some of these responsibilities include, philosophy, law making, decision-making and enforcement, governance, learning and teaching, communication, economics, trade, defense, child rearing, providing, conflict resolution, and strategy. The clan teachings are agreements that govern how individuals and families take care of each other and the community as a whole.

We are choosing to implement our clan system for the first time within a modern context. We will utilize the clan structure and protocols for the purpose of community engagement. Each clan will appoint a representative to the main clan body. The main body will work with the Executive Board, to determine the most effective and productive strategies to empower and engage our residents. Each clan leader reports directly to his/her clan and the clan determines how they will involve the members of their clan in the process. Clans determine their own internal methods of communication and decision-making. Individual clan decisions are brought back to the main clan and our consensus decision-making model and dispute resolution models will govern the process. This is the basis of our engagement plan.

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Risks and Mitigation Strategies

Our approach to risk and how we determine and mitigate or avoid risk is discussed in Chapter 3. This table summarizes the risks associated with community engagement and the risk management approach and mitigating actions to be taken.

Risk	Likelihood	Impact	Risk Management Approach/Mitigating Actions
Lack of Support of the proposal	Low	High	• Establish meaningful process • Be accountable & report • Provide education
Loss of faith and trust if there is no consistent follow-up by staff.	Low	High	• Establish measureable goals. • Plan for short term achievements • Set achievable action plans • Be accountable and transparent
Unrealistic stakeholder expectations and demands.	Medium	Medium	• Be clear about the reasons for engagement • Clear and consistent communication • Provide education • Dispute resolution process
Lack of interest	Medium	Medium	• Select group appropriate strategies • Know your audience • Ensure the activities are fun, social and specific to your audience
People made feel excluded	Low	Medium	• Use existing networks and structures • Provide several opportunities for people to have input • Ensure culturally appropriate methods • Customize approach to audience we
Limited knowledge on clan system	High	Medium	• Utilize knowledge holders in community • Conduct research • Bring in elders who know about clans • Training • Ceremony
Triggers trauma – direct and inter-generational	Medium	High	• Create awareness of possibility – share previous examples/similar stories • Include ceremony • Social Services support programs • Cultural Coordinator support programs
Don't meet outcomes	Low	High	• Set up good planning • Realistic outcomes – needs based – measurable • Set up reporting and accountability • Supportive budget, governance systems, management system
People are not aware of what's going on	Medium	Medium	• Communications plan • Use various approaches to inform people • Be creative – go to them
Lack of time	Medium	Medium	• Live stream meetings • Use BiigtigongX • Provide information to them – video, tv, print, car, phone • Make it interesting, fun and useful

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Chapter 7: Privacy

Introduction

Privacy is of the utmost importance to our leadership, project team and community as a whole. Given that this project entails a blended learning environment of both online and real-world opportunities this project will result in the generation of new data from users creating accounts on the Open edX platform. As such, it is critical that this project be developed and implemented with significant consideration given to privacy and data security. The following chapter outlines our data management plan.

Preliminary Privacy Impact Assessment (PIA)

Given that this project involves the collection of some personal data, it is necessary to complete a Privacy Impact Assessment (PIA). In preparing this proposal, the project team has completed a preliminary privacy impact assessment through reliance on applicable regulations and our internal governance strategy and through incorporating feedback from the Office of the Privacy Commissioner of Canada. The PIA is submitted under separate cover.

The Preliminary PIA covers all proposed activities under the SMART Cities project, including how data will be sourced and accessed through the Open edX platform. Considerations have also been made for: Data Storage, Data Access, Data Retention and Data Disposal required throughout the lifespan of this project. The project team will continue to assess the project's privacy risks and impact to determine if there is a need to update the privacy analysis and/or the PIA report. This ongoing assessment is an essential part of identifying and mitigating new issues and changes impacting privacy that may arise during the implementation phases.

This Chapter of the Smart cities Challenge includes much of the information includes in the preliminary PIA, as well as additional details as specified.

Compliance with Applicable regulations.

The following table outlines the result of our compliance analysis:

Policy Process Statement	Process and Compliance measures
Purpose of the collection of personal information	This project involves creating a blended learning environment with both online and real-world components. The nature of an online learning environment results in the collection of minimal personal information to create an account, name, user name and password. Additionally, certain functionalities of the Open edX platform, such as the meetup application or time spent watching videos, will also generate data on a user's location and behavior patterns. Another source of data is the videos, stories, overdubbing etc. that will be created for the language immersion education and STEM bilingual courses portion of the project. This data will be stored on the Open edX platform as well as in a redundant hard-copy format (ie, transcripts, tapes etc) to ensure data is not lost. There are no additional privacy concerns associated with storing physical copies of the educational materials. All information identified is absolutely necessary for participating in the project and/or for monitoring the success of the project

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Source of personal information/ Accuracy	Initial data will be provided directly by users to generate their profile and then data will be tracked using their Open edX account. For example, it will be necessary to track users time spent watching video to provide assurance that the student has completed the necessary videos for completing the curriculum requirements. Given that the curriculum will be developed in a blended learning environment (brick and mortar and online) this will only include the collection of data related to activities completed in the Open edX platform. Activities completed within the brick and mortar school will continue to be tracked by teaching staff under existing processes. Qualitative data will also be collected by teachers for users to inform feedback on the project, monitoring, evaluation and control purposes. Personal information will be collected directly from the Open edX platform by teaching staff only. Collection of data from teaching staff will be required and is appropriate given the context of this project. Given that information is provided directly by the user through the online platform, we do not anticipate any major inaccuracies. Likewise, the anonymized and summarized data to be provided by teaching staff is subject to their current process which ensure accuracy and privacy of student information.
Accountability and Openness	The project team is accountable for the data collection, management and safeguarding results from this project. The project team has intentionally minimized the amount of personal information to be collected through use of Open edX platform, as users will only need to provide their name, user name and password to create an account. Likewise, we will implement a process that enables students and their legal guardians to provide informed consent to participate in this voluntary process, thus ensuring they understand what information will be collected, why, and who will have access to it.
Manner of collection of personal information	The data to be collected is minimal and relatively not intrusive. It is similar (if not identical) to the information already being collected and managed by the school system. Similarly, the information collected via the Open edX platform is typical for any online platform. Use of the meet up application is voluntary, and any users will be provided a privacy statement to agree to prior to using this forum (i.e. authorizing sharing of user location data)
Limiting Use, disclosure and Retention	Teaching staff are already subject to policies and codes of conduct that govern how they treat personal information, through to physical or technical controls that protect the information. Safeguards that will be into place include physical security; IT security; staff training; policies, confidentiality clauses in contracts with external providers etc. Information, such as language videos, transcripts etc. are to be stored indefinitely as these are important records of our language and traditional teaching that we are attempting to preserve as part of this project. Personal information will only be used for the purpose it was collected for, and as described. The personal information collected for the students will only be retained until graduation. Following successful graduation, all student data will be removed from the server and student accounts will be disabled.

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	The collection, use, retention and disclosure of personal data, and particularly student data, should always be limited to what is necessary to fulfil authorized purposes. Reducing the risk posed by the excessive collection of student data is a core principle that guides this project's data processing practices.
Access and correction to personal information	Users will be able to access the account information on the Open edX platform. Information collected by teachers will be subject to the policies and procedures currently in place in the school system. Information will be shared with students and parents through existing channels (i.e. report cards). Access logs will be implemented to track access to personal information. Teachers can correct their existing report card writing process based on information collected. For example, should a student choose not to use the meet up forum, the teacher would reflect the true involvement in traditional activities in that student's report card, regardless of the data output from Open edX. Requests for personal information to be corrected will be handled on a case by case basis. However, we do not anticipate any major concerns with meeting this principle as all information collected is basic in nature and expect most changes, if any would be minor in nature such as their name, username or password changes.
Accuracy etc. of personal information	Given that information is provided directly and automatically by the user through the online platform, we do not anticipate any major inaccuracies. Likewise the anonymized and summarized data to be provided by teaching staff is subject to their current process which ensure accuracy and privacy of student information. The process for anonymizing the data will involve the teaching staff providing the project team a summary report detailing quantitative data needed to provide details needed to track and report on performance indicators. This will include: • number of K-12 STEM courses successfully completed by K-12 students • number K-12 students needing remedial help in STEM subject areas • number of K-12 students who know the key concepts expressed in each of our core aadsookaanan • participation rate in number of traditional Nishnaabe activities for K-12 Students No personal or identifying information will be shared, nor will it be required, by the project team. The summarized data, omitting all personal information, is required by the project team to track, monitor and evaluate the implementation of the project, and to make course corrections when necessary. Qualitative data will also be collected for teachers to provide feedback on the project, for monitoring, evaluation and control purposes.
Data Disposal	Data stored on the Open edX platform will be expunged following a student's graduation.

Data Management process

This section outlines the types and methods of data collection, generation, analysis, storage, and preservation that reflects the entire data lifecycle in project design. The Data to be collected during this project is associated with the inputs and outputs, as described in our performance measurement strategy presented in Chapter 2.

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Step 1: Gain informed Consent:

In order to ensure participants (and their legal guardians) make an informed decision when providing their consent to participate in the Open edX platform, a privacy seminar will be held at the community centre prior to program roll out. During this seminar, the project team will review the project and the content of this Privacy Impact Assessment to ensure participants (and their guardians) are knowledgeable of the inherent risks of participating in a partially-online learning platform. This seminar will overview what information will be collected and why, who will have access to this information once an account has been created and what agreements are in place (at that time) with all 3rd party providers. This seminar will also allow community members to voice their privacy concerns with respect to participating in an online environment. The project team will also present the policies and procedures developed thus far to mitigate any identified privacy risks and how any data breaches will be managed, as described within this document and further iterations of the PIA.

Should students, or their legal guardians, opt-out of the online-augmented (i.e., blended-learning) program, they will be given alternative means of participating in the k-12 curriculum at the brick and mortar school. It is important to note the participation in this Open edX platform is 100% voluntary and if not adopted will not diminish the learning of non-participates. Participants and their guardians will be provided a consent form outlining the privacy concerns and risks, for review and signature prior to enrolling in the Open edX platform.

Its should be noted that as outlined in the PIA, in an effort to mitigate risks, the project team will work with Technology/Software providers, including Open edX to enter into a contractual agreement which will ensure personal information is handled in a privacy-compliant manner, and restricts the third party's use of personal information for proposes outside the project scope. In all cases the user will be advised about any third party's privacy policies/statements when directed to a third-party site for additional links or resources, as part of informed consent process.

Step 2: Personal Information Data Collection

Users of the Open edX platform will be required to provide the following types of personal information. This information will then be use by teaching Staff to offer better service to participants.

- Account creation and login information, including user name and password *
- Location information - anytime the student interacts with Open edX platform, location data is generated **
- Patterns of behaviour (which educational video were watched and for how long)

*Students will not be asked to provide their address, date of birth or other identifying information for the purposes of setting up an account with Open edX. The intent of collecting a user name and password is only to allow a student to create an account and login to the Open edX platform and to enable teachers to track a student's progress.

**Due to the very nature of the internet anytime a person connects, the media that is being delivered to that person is tracked using a particular 'IP address.' Location data is then deduced from that IP address. There is no reasonable (or perhaps possible) way to interact with the internet without generating location data. Total location privacy is not possible within the current

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organization of the internet since IP addressing is a foundational part of the internet. As such we can only attempt to maximize our privacy online - while accepting that our location will always be exposed.

Step 3: Data Analysis

Information to be collected will include the name/user name of the student and the amount of time a student spends watching a video, as well as any participation in any traditional activities as tracked through the meetup forum functionality. Similarly, should students identify participation in traditional activities through the meetup forum functionality of Open edX, this will generate location data.

No additional information will be provided regarding the student's performance in other school programs. Again, this is a voluntary blended-learning environment (online and/or brick & mortar, but not online only) and therefore the intent is to not replace what is currently being done at the school level. All collection of student data will be limited to what is needed for educational purposes.

Teaching staff are the only project resources who will have access to the student specific data. No other project team member will have access to individual student specific information. No information will be made public. Teachers require access to student specific data as it is needed ensure a student has completed the required curriculum. Behaviour data is also required to make teachers aware of how long a student struggled with a particular math problem, or how many times the student rewatched a video, and which sections of the video were rewatched, for example. This is one of the main benefits of using a blended-learning approach as this "behavioural pattern" data is what helps our teachers teach more effectively.

Teachers will not provide information about a student to Open edX nor to Appsembler. The flow of information is from student to Open edX to teacher, which is then provided back to the student in the form of a report card and to the project team in the form of aggregated summary data for performance measurement tracking only. In other words. Teachers will summarize the data and submit to the project team for performance monitoring and process improvements. I

With respect to information collected by 3rd parties, this will all be as per the contractual agreement. All terms of these agreements and risks to privacy resulting form 3rd party platforms and software will be communicated to users (and guardians) as part of the informed consent process.

Step 4: Store and Dispose of Data

Minimal student data will be stored on Open edX platform, over the course of their school. Data stored by teachers (i.e. in the form of records and report cards) is governed by their existing policies and procedures. With respect to input data such as the videos, stories, overdubbing etc. that will be created for the language immersion education and STEM bilingual courses portion of the project. This data will be stored on the Open edX platform as well as in a redundant hard-copy format (ie, transcripts, tapes etc) to ensure data is not lost. There are no additional privacy concerns associated with storing physical copies of the educational materials.

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All information identified is absolutely necessary for implementing the project, participating in the project and/or for monitoring the success of the project. Student Data stored on the Open edX platform will be expunged following a student's graduation.

Other Uses

There are no plans for and transmission, and plans for re-use, re-distribution, derivative production, archiving, student personal data. All other data, including videos, are to be made publicly available.

Open and Big Data Strategies

Only once this framework is expanded to different communities with different objectives will the use of big data be necessary to track the different uses and functions of this curriculum. At this point, open data will be used to report progress, engagement, best practices, etc. This information will not pertain to specific individuals, but specific user bases as whole. For example, data may summarize user rates, and immersion progress of a specific community, but not specific students of that community.

Privacy Risks and Mitigating Strategies

Risks and Mitigation Strategies are discussed throughout this chapter (and others). Three key risks are summarized in the table below:

Risk	Mitigating Strategy
Use of information by 3rd parties	The project team will work with Technology/Software providers, including Open edX to enter into a contractual agreement which will ensure personal information is handled in a privacy-compliant manner, and restricts the third party's use of personal information for proposes outside the project scope. In all cases the user will be advised about any third party's privacy policies/statements when directed to a third-party site for additional links or resources, as part of informed consent process.
Security Breach	The project team will develop and implement a breach response policy and protocol that addresses privacy and security risks for both the online and offline platform/storage methods. Information custodians, namely Teaching staff, Chief and council, and the database administrator must immediately contact the Database administer and Privacy Officer, informing him of the following: • the nature of the breach; • the information that was exposed; • to whom it was exposed; and • for how long it was exposed. The Information Custodian will work with the Privacy Officer who will advise whether notice to affected individuals and the Office of the Information and Privacy Commissioner of Ontario (IPC) is required. If such notice required, the Privacy Officer will work with the information custodian to meet the needs of the IPC.
3rd party software/technology becomes outdated	Reliance will be placed on existing websites for STEM education (i.e. code.org). As these are established organizations, that are constantly updating and revising content to better engage youth and other users in this field, there is some chance that this 3rd party software at some point may become dated. However, SMEs will continuously monitor content and explore alternatives should the desired content become outdated or unavailable

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Chapter 8 - Financial Management Plan

Introduction

Biigtigong has a responsibility to its citizens to accurately account for public funds, to manage its finances effectively and efficiency, and to plan to provide quality needs-based services. As a government we are responsible for implementing effective systems of public financial management and for utilizing these systems to safeguard public assets. The effective management of public finances is fundamental to the development and growth of the community.

Financial management is a critical prerequisite for success. It is an integrated process that brings together strategic planning, budgeting, accounting, reporting, controls, procurement, auditing, policy and people with the goal of managing resources strategically to achieve the project's outcomes. Effective financial management includes planning, organizing, directing and controlling the financial activities to support the organization's goals.

Authority

Biigtigong's Constitution assigns Chief and Council the responsibility to effectively and efficiently manage and control public funds. They have the authority to establish institutions and appropriate legislation, polices and procedures, with supporting governance structures, to govern the financial matters of the First Nation. The Constitution recognizes the leadership's responsibility for accountability, transparency and results.

Financial Management Objectives

Biigtigong's financial management objectives are as follows:

- To enable the delivery of quality services to our membership that are geared to meet their needs.
- To make effective and efficient use of the available resources.
- Be accountable to our membership and other stakeholders.
- Prepare for long-term sustainability.
- Manage risks.

Sustainability and Diversification

The goals of our Smart Cities proposal are aligned and part of Biigtigong's bigger and longer-term vision. As such, it is not considered an independent project, with a start and end date. Our five-year implementation stage is designed to develop the necessary resources and capacities to ensure long-term sustainability of the program goals and objectives. As we begin our implementation, collaborative efforts with our internal departments on specific aspects of our proposal are setting the stage for long-term sustainability and integration.

Governance Structure

Establishing appropriate governance structures that support and facilitate the delivery of our programs and services to our membership is part of an effective financial management plan. Chapter 5 describes the governance structures.

Responsibilities

Establishing clear roles and responsibilities and ensuring a shared understanding of these roles are important to sound financial management. Financial management roles and responsibilities are defined in the financial polices. In addition, these are reiterated in the details of job descriptions, department

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mandates and terms of references for committees and boards. All of these are in place for the Smart Cities proposal implementation.

The Chief and Council's primary responsibility is to establish appropriate laws and policies to govern the sound financial management of finances. Management is responsible for the implementation of these laws and policies and ensuring adequate procedures and systems are in place for support. Management is responsible for communicating the expectation and duties to staff. Staff and operating personnel are responsible for carrying out the internal control activities set forth my management.

Transparency

Creating a culture of transparency throughout the organization is one of the foundations of sound financial management. Developing principles of careful budgeting, reporting and auditing, combined with internal controls and transparency ensures a robust system of financial management.

The following provides some measures that Council has taken to provide transparency:

- Open Council meetings; public access to by-laws, minutes and reports.
- Council publishes the annual approved budget and financial statements.
- We have expanded our Internet and social media presence including some online services.
- Feedback and complaint mechanism are in place.
- Procurement policy is comprehensive and regulates the procurement of goods and services, including human resources.
- Conflict of Interest policy guides the disclosure and management of conflicts of interest.
- Codes of Conduct are established for members of Council, management, staff, committee members and the membership.
- Public access to information is guided by policy.
- Extensive community engagement culture; continuous opportunity for community to be involved in the decision-making processes.

Our Smart Cities team will adhere to the regulations and expectations established by Council via their formal and informal policies. Our team is committed to building an open and transparent relationship with all of our stakeholders. Transparency is of special importance to our team, as we are making new paths and facilitating a significant change at the community level and establishing trust is important. We will create opportunities to be transparent and ensure our organizational culture and systems support transparency.

Rigorous Internal Controls

Internal controls ensure that the organization is in compliance with laws and regulations and protects assets against theft and misappropriation. In general, segregation of financial duties to provide a set of checks and balances, proper authorization of expenditures, physical control of assets, and maintenance of records and documents supporting financial activities are the foundation of an adequate control environment. Sound financial management also requires regular reconciliation and review to ensure that activities reported in the organization's accounting records are crosschecked against the supporting documents.

Internal control is all of the policies and procedures management uses to achieve the following goals:

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- Safeguard assets - well-designed internal controls protect assets from misappropriation of public funds, accidental loss or loss from fraud.
- Ensure the reliability and integrity of financial information. Internal controls ensure that management has accurate, timely and complete information, including accounting records, in order to plan, monitor and report business operations.
- Ensure compliance - Internal controls help to ensure the First Nation is in compliance with the many federal and local laws and regulations affecting the operations of our business.
- Promote efficient and effective operations - Internal controls provide an environment in which managers and staff can maximize the efficiency and effectiveness of their operations.
- Accomplishment of goals and objectives - Internal controls system provide a mechanism for management to monitor the achievement of operational goals and objectives.

Our finance policy and operating procedures identify the internal controls that are mandatory for all operations. These controls are regularly reviewed and adjusted accordingly in our efforts for continuous improvement. Our Finance and Audit Committee, in conjunction with our Senior Management Team, provide Council with recommendations for improvement. The implementation of our Smart Cities proposal will be subject to the internal controls and procedures as established by our financial management systems.

Finance Policy Manual

Our finance policy manual is the central means to communicate the financial controls and responsibilities. In order to successfully mange a project a coherent set of accounting procedures and standards are required. Our finance policy manual addresses the following matters:

- Delegated and Assigned Responsibility
- Planning and Budgeting
- Tangible Capital Assets
- Investments
- Procurement
- Payroll
- Benefits
- Travel and Training
- Loans, Guarantees and Indemnities
- Expenditures and Payables
- Borrowing/Debt
- Financial Reporting
- Insurance
- Records Management and Retention
- Risk Management
- Information Technology
- External Audit

Financial Management Software

Biigtigong utilizes a financial management software program named Xyntax, specifically designed to meet the financial needs of First Nations. The software manages all accounting procedures of the organization, such as, cash flow management, general ledger, expenses, payments, assets, income and purchasing. It efficiently manages all financial administrative processes. The software is customizable to suit the specific needs of our organization. The staff who will be assigned the

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responsibility of financial management are familiar with and have extensive experience with the financial management software that will be used for the Smart Cities project. The software will also allow for specific project codes that could coincide with the identified outcomes and milestones.

Accounting Methodologies

Biigtigong utilizes project based accounting. Project accounting tracks all the financial components of a project. It provides access to more accurate and timely information when making decisions. It allows for an actual-to-budget analysis. Project accounting provides for more accurate accounting of project job costs. It provides for a more credible audit process and facilitates better control over projects. Project accounting also can help gauge the team's workload capacities.

Accrual basis accounting

Biigtigong uses accrual basis accounting methods. Under the accrual basis, revenues and expenses are recorded when they are earned, regardless of when the money is actually received or paid. Accrual basis provides a more realistic idea of income and expenses during a period of time. This method requires a careful monitoring of cash flow.

Generally Accepted Accounting Principles (GAAP)

Biigtigong complies with the Generally Accepted Accounting Principles. GAAP is a collection of commonly followed accounting rules and standards for financial reporting. GAAP compliance makes the financial reporting process transparent and standardizes assumptions, terminology, definitions and methods. The purpose of GAAP is to ensure financial reporting is transparent and consistent from one organization to another.

Financial Reporting

We adhere to a regular internal reporting system to ensure we are meeting our financial goals and objectives. Program Directors follow a strict regiment to review financial reports monthly and complete a series of financial tasks. Central to effective decision-making and having the ability to take corrective actions is having access to accurate and timely financial data.

Financial reporting requirements stem from a variety of sources, and financial reports serve many purposes. For example, they serve as tools for use by managers to control their departments and to monitor the extent to which management's objectives are being achieved. They also provide information to external parties on an organization's financial operations and compliance with a variety of requirements. Our Smart Cities management team will adhere to the reporting requirements as defined by Biigtigong and our funding agencies. We will ensure stakeholders have access to timely and accurate reports to allow for good decision making.

For the purpose of our proposal, our reporting system will have to be customized to accommodate the meeting of milestones, as per the contribution agreement. The SC Executive Board will provide regular written reports to the Director of Finance regarding the status of achieving the milestones. These reports will be developed based on the performance reports received from the project implementation staff. These reports will provide the necessary information needed to be the reporting requirements of Infrastructure Canada.

Human Resource Management

Human resource management is a critical success factor for the First Nation and it directly determines the business outputs. Human resource development and management play an important role in the

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overall financial management of our operations. We aim to maximize employee performance and create a supportive organizational culture to facilitate this.

Human Resource Planning

Through effective job analysis and design, we created positions with job descriptions and specifications to meet the needs of the organization and project implementation. The following chart summarizes our human resource requirements to implement our Smart Cities proposal. The majority of the budget will be allocated to human resources, making human resource management especially important to our financial management plan.

Human Resource Requirements – Smart Cities Proposal					
Position	Reporting to	Status	Time Period	Salary Grid Classification	Salary Range
Governance					
Proposal Lead	Executive Board	½ time	5 year	SM2	84,864-95,472
Project Coordinator	Proposal Lead	Full time	5 year	PS3	41,457 -54,092
STEM Implementation					
SC Education Lead	Education Director	Full time	5 year	T2.2	55,500 -81,600
CompTIA A+ Lead	SC Education Lead	Full time	5 year	T2.2	55,500 -81,600
Co-op & Business Coordinator	Economic Development Manager	Full time	5 year	PS3	41,457 -54,092
reBOOT Coordinator	Economic Development Manager	Full time	5 year	EA2	29,766 -38,839
WaaWaa Immersion Video Production					
Immersion Lead	SC Education Lead	Full time	5 year	T2.2	55,500 -81,600
WaaWaa Instructor	Immersion Lead	2 -½ time	5 year	ECE2.2	37,756-49,263
Nishnaabemwin					
Audio Overdub	Proposal Lead	Full time	5 year	Contract	85,000
Bilingual STEM	Proposal Lead	Part time	5 year	Contract	12,500 – 55,000
Meet-up Function					
Meet-up Coordinator	SC Education Lead	Full time	5 year	PS1	37,669-49,149
Technology					
BiigtigongX Administration	Project Coordinator	Part time	5 year	Monthly contract	1,200
Database Administration	Project Coordinator	Part time	5 year	Monthly contract	500

Human Resource Management Tools

Biigtigong uses the following tools to assist in our efforts to maximize employee performance and meet our operational goals and outcomes:

1. Hiring Policies: Provides process to hire, interview, recruit, and determine if you will need to implement training or development for potential or current employees.
2. Termination Policies: Provides process to deal with termination or voluntary resignations.
3. Job Descriptions: Establish clear roles and responsibilities and qualifications.
4. Employee Performance reviews: Provides mechanisms to conduct performance reviews and evaluations of staff.
5. Employee Handbook: Provides a snapshot of our policy guide.
6. Health and Safety Policy: Provides health and safety standards and procedures.
7. Discrimination/Sexual Harassment Policies: Process on how complaints and investigations will be handled.
8. Detailed Policies: Regulations regarding benefits, such as, vacation, holiday, personal, and sick pay, company benefits, salaries, etc.

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9. Required Policies: Required policies are anything that the federal, provincial or local governments require (WSIB, EI, CPP).
10. Specific Policies: Confidentially Policy, Social Media Policy, Cultural Leave Policy.

The Budget Process

The budget process is one of the most important components of successful financial management. The budget process extends beyond the preparation of a document that appropriates funds. Budgeting is strategic nature, encompassing multi-year financial and operating plans that allocate resources on the basis of identified goals. It serves as the performance benchmark for all financial decisions. A budget ensures that an organization can fund its commitments, meet its financial and program objectives and control spending. It allows for measurement of performance and the identification of potential problems. The budget is the overall financial framework.

The development of Biigtigong's Smart Cities budget was done in accordance with the budget policies of the First Nation. The budget was also developed in consideration of the expectations as identified in the Smart Cities Finalist Guide. Our budget supports the implementation of our proposal and the achievement of our goals.

Biigtigong's Annual Planning and Budgeting Schedule

Task	Individual Responsible	Timeline
Annual planning kickoff meeting to present major budget policies, multi-year financial plan direction and guidelines for the strategic plan.	Director of Finance, Senior Management Team, Finance & Audit Committee	3rd week in November
Update Tangible Capital Assets.	Senior Management, Director of Finance	1st week in December
Each Department prepares a thorough analysis & projection of all expenses for the budget yr.	Senior Management Team	2nd week in January
Consolidate all draft budgets including capital budget into one master budget;	Director of Finance	4th week in January
Multi-year plan and strategic plan developed or updated.	Senior Management, Director of Finance	1st week in February
Senior management reviews draft budgets, multi-year plan, and strategic plan.	Senior Management, Director of Finance	2nd week in February
Present budget, multi-year plan, and strategic plan to Finance & Audit Committee for review, discussion, and modification.	Director of Finance, Senior Management Team, Finance & Audit Committee	3rd week in February
Incorporate Finance & Audit Committee changes to any of Planning Documents	Director of Finance, Senior Management Team, Finance & Audit Committee	1st week in March
Inform the membership or involve the membership in consideration of the annual budget and the multi-year financial plan.	Director of Finance, Senior Management Team, Finance & Audit Committee, Council	3rd week in December
Council reviews & approves budget/multi-year plan/strategic plan based on recommendation from the Finance and Audit Committee.	Council, Finance & Audit Committee	3rd week in March
Distribute approved budget and strategic plan to Department Heads and any other appropriate staff and community.	Director of Finance	3rd week in April
Inform membership of approved budgets.	Director of Finance, Senior Management Team, Finance & Audit Committee, Council	3rd week in May
On going monitoring, reporting and reviews.	Director of Finance, Senior Management Team, Finance & Audit Committee, Council	Throughout the year

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Chapter 9: Implementation Phase Requirements

Introduction

Biigtigong Nishnaabeg is committed to meeting the applicable municipal, provincial and federal reporting and legislative and policy requirements should we be selected as a winner.

Duty to Consult with Indigenous Groups

Biigtigong is a First Nation community and therefor the Duty to consult with indigenous groups does not apply. However, with that being said, we want to acknowledge that Biigtigong Nishnaabeg has policy regarding Duty to consult. This document outlines how Biigtigong Nishnaabeg expects to be approached regarding activities within their traditional territory. This guideline establishes Biigtigong's expectations, policies and practices for governments and others to follow when consulting with them. Our Smart Cities Team reviewed this policy as we were developing our engagement strategy with the community. We wanted to build upon best practices established in the community and develop a solid engagement strategy.

Modern Treaty Obligations

With the exception of six First Nations, Biigtigong being one, the area First Nations are signatories to the Robinson-Superior Treaty of 1850. There are no modern treaties in the Biigtigong Nishnaabeg traditional territory or shared territory with surrounding First Nations.

Canada's Community Employment Benefit (CEB)

Projects supported by the Investing in Canada Infrastructure Program provide an opportunity to promote increased employment opportunities for a broader array of Canadians. The Smart Cities Challenge requires the finalist to identify employment and/or procurement opportunities for at least three of the targeted groups and how Biigtigong intends to report upon CEB requirements, should we become a winner.

To meet these requirements Biigtigong has selected the following 3 target groups: Indigenous peoples, woman and youth. The main beneficiary of our Smart Cities proposal is Canada's Indigenous youth. Our projects are specifically aimed at this group with the ultimate goal of making them more educated and more employable. We will include woman as a specific category that we will also target. We will ensure our indicators for success specifically capture data on these 3 identified groups, in terms of their participation in our projects. We anticipate that 90% of our participants will come from one of these groups.

Additionally, we will utilize our procurement strategies and direct our hiring towards these 3 groups. We expect that at least 80% of our work force for this project will be Indigenous, a youth or a woman. It will be very easy to meet these targets and to track the relevant supporting data.

Reporting on the CEB Requirements

As per the CEB requirements, we will report annually on the progress made. Should we be selected as a winner, we will develop a detailed strategy that also defines our reporting requirements. CEB requires some specific information and we will accommodate this requirement. For example, we need to track the number of hours worked by the target population and/or the value of contracts awarded to the target groups. Our accounting software allows us to easily track this information.

A qualitative narrative that describes the progress made is also required. The narrative will provide information on both the successes and challenges experienced in meeting our targets. We understand

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that this information will help in developing Canada's strategies to offer more diversified employment and procurement opportunities.

We will develop specific reporting mechanisms to support any requirements or conditions of being a selected a winner. We have experience establishing targets, monitoring progress and being flexible to respond to isses.

Risks and Mitigating Strategies

Risk	Likelihood	Impact	Mitigating Strategies
Woman at home with no child care	Medium	Medium	• Provide childcare support at the daycare • Work with other supports in the community
Work readiness levels are low amongst participants	Medium	Medium	• Community programs exist that provide assistance in this area – use these • Long-term strategies
Youth experiencing social and emotional issues	High	High	• Social Service support programs • Cultural support programs • Life skills component built in • Use of elders in the programs • Utilizing land-based learning program
Lack of parent support	Low	Medium	• Provide information and education to the parent • Offer home-visits • Engaging and non-judgmental approaches • Utilize existing relationships
Lack of formal education and skill set to do some specific tasks	High	Low	• In the short-term we will have to recruit from outside the population • Develop long-term capacity development to attain education and experience
Current procurement policy may not support goals	Low	Low	• Review policy & recommend changes • Conduct education on updated policy
Political leadership lack of understanding of the project procurement goals	Low	Medium	• Address in person at a council meeting • Provide research and education • Regular reporting and communication
Lack of financial resources to implement training programs	Low	High	• Council has already made a commitment to direct some resources to summer employment • Develop funding proposals
Data security and protection of personal information	Low	High	• Data and Privacy Policy • PIA completion • Communications & education • Disclosure and Transparency strategy

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March 2019

Smart Cities Challenge

Katinnganiq: Community, Connectivity and Digital Access for Life Promotion in Nunavut

Canada

Government of Canada's Smart Cities Challenge

A partnership between the Nunavut Association of Municipalities, Embrace Life Council, Qaujigiartiit Health Research Centre and the Pinnguaq Association

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Executive Summary

Katinnganiq: Community, Connectivity and Digital Access for Life Promotion in Nunavut

Challenge Statement

> ***Our communities will implement protective and preventative measures to reduce the risk of suicide in Nunavut, which is ten times the national average, and increase the amount and accessibility of peer support networks, educational resources and creative outlets that promote positive Mental Health to all Nunavummiut.***

Chapter 1; Vision: This chapter outlines the vision for our proposal and provides the evidence for our vision as well as justification of the changes that were during the finalist phase.

Chapter 2: Governance: This chapter outlines the governance framework that will structure our proposal moving forward and provides a detailed description of its composition and how it will provide the platform for achieving outcomes.

Chapter 3; Performance Measurement: This Chapter articulates the goals as ultimate outcomes, identifies the inputs and activities in a logic model, shows the KPIs which will be used to measure progress, develops the specific outputs and outcomes for each activity.

Chapter 4: Project Management: This chapter outlines how the initiative would be implemented and managed. It will describes the several work streams, tasks and subtasks.

Chapter 5: Technologies: This chapter provides an outline and description of the different technology aspects that are part of this proposal

Chapter 6: Data and Privacy: This chapter provides a description of our approach to data and privacy for the implementation of this initiative

Chapter 7: Engagement: This chapter describes our outreach methodology and engagement activities that were undertaken during the finalist phase.

Chapter 8: Implementation: This chapter describes our plans for meeting legislative and policy requirements regarding the duty to consult with Indigenous groups, modern treaty obligations, and the Community Employment Benefits Plan.

Chapter 9: Financial: This chapter provides class B estimates for our budget costs, it outlines the general budget for this initiative, and reports on the finalist grant utilized.

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Chapter 1: Vision

Our final proposal continues to be based on the challenge statement above, yet has departed from our initial proposal by redirecting our proposed activities using a ***life promotion*** approach to suicide prevention, which is "based on the belief that all young people are capable of finding their own path to a holistic and meaningful life"[1]. As defined by the *Together to Live* online toolkit developed by the Ontario Centre of Excellence for Child and Youth Mental Health:

> "life promotion efforts are holistic, strengths-based and empowerment-focused. They align seamlessly with recovery-oriented models of mental health care as they aim to honour young people's individuality and build their resilience through their personal strengths, available resources and relationships with those around them. Life promotion doesn't focus on reducing suicidality as much as it focuses on cultivating the strongest possible safeguards against it – namely young people's **sense of belonging, meaning, purpose and hope**. Life promotion also considers the influence of factors such as cultural heritage and values, community resources and support networks in shaping one's mental health"

As a result, **the *Katinnganiq: Community, Connectivity, and Digital Access for Life Promotion in Nunavut* proposal**, submitted on behalf of the 25 municipalities of Nunavut, is a multifaceted and collaborative effort to create both physical and digital spaces that address the digital divide in Nunavut, both in terms of access to improved broadband connectivity as well as in spaces to access to digital tools and literacy curriculum as important protective factors to risk of suicide. Our initiative offers opportunities for Nunavummiut to connect and share knowledge with each other through peer networks, learn skills through culturally responsive educational resources and extra-curricular activities, and to express themselves through creative outlets

[redacted] environments as pathways to mental wellness.

[redacted] 'hat our preliminary proposal began to articulate as a suicide prevention strategy [redacted] d of six distinct categories of activities (Makerspaces, the te(a)ch computer [redacted] ning curriculum, mesh networks, digital art therapies, mental health and wellness [redacted] ons, and the 211 Nunavut Application), we now see materializing as a more holistic [redacted] ing, built within a life promotion framework that understands community [redacted] ices as safe and nurturing social hubs that provide programs, tools, and resources that [redacted] art, culture, language, and technology; while maintaining mental health as its priority [redacted] ng individuals to find and engage with their own sense of belonging, meaning, purpose

Our proposal understands the concept of **mental wellness**, defined by the Alianait Inuit Specific Mental Wellness Framework, as "self-esteem and personal dignity flowing from the presence of a harmonious physical, emotional, mental and spiritual wellness and cultural identity"[2]. Additionally, the First Nations Mental Wellness Continuum Framework, developed jointly by the First Nations and Inuit Health Branch (FNIHB) of Health Canada, the Assembly of

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[1] "What is Life Promotion?" *Together to Live*. N.p., n.d. Web. 18 Dec. 2018. <http://www.togethertolive.ca/what-life-promotion>

[2] *Alianait Inuit Mental Wellness Action Plan*. Alianait Inuit-specific Mental Wellness Task Group, 2007. Page 9. Web. 7 Jan. 2019. <https://www.itk.ca/wp-content/uploads/2009/12/Alianait-Inuit-Mental-Wellness-Action-Plan-2009.pdf>

First Nations (AFN), and Indigenous mental health leaders from various First Nations non-governmental organizations, defines mental wellness as:

> "a balance of the mental, physical, spiritual, and emotional. This balance is enriched as individuals have: **purpose** in their daily lives whether it is through education, employment, caregiving activities, or cultural ways of being and doing; **hope** for their future and those of their families that is grounded in a sense of identity, unique indigenous values, and having a belief in spirit; a sense of **belonging** and connectedness within their families, to community, and to culture; and finally a sense of **meaning** and an understanding of how their lives and those of their families and communities are part of creation and a rich history."[3]

In other words, throughout this proposal we utilize an understanding of mental wellness conceptualized in terms of a whole that balances spirit, emotion, mind, body and culture. As proposed by Dr. Jeffrey Ansloos, an Indigenous understanding of mental wellness contrasts with the standard definition of mental health held by the broader field of mental health practices in Canada; that despite "increasingly integrating culturally grounded approaches to healing within mental health services, [...] fails to consider how Indigenous knowledge may be epistemologically dissonant with mental health paradigms"[4]. Similarly, as proposed by Jennifer White and Christopher Mushquash, "Standard suicide prevention practices which make assumptions about sources of distress and are predicated on models of expert interventions and individualized treatments can sometimes be out of step with non-western, non-European cultural conceptualizations of mental health and well-being. Being culturally responsive means being attuned to local, historical, and sociopolitical influences on mental health and well being, and developing solutions that build on local strengths and address historical and contextual realities"[5].

For White and Mushquash, a transformative, life promotion approach based on Indigenous values, "is less about implementing discrete suicide prevention programs, and more about **creating the conditions for Indigenous children, youth, families and communities to flourish,** preserve their languages, reclaim their land, recover their cultural and spiritual practices, and exercise their sovereign rights to be self determining, [...] so that they can resiliently pursue lives of dignity, with purpose, hope, belonging, and meaning; and be enabled to realize their full potential"[6]. Similarly, the Wise Practices initiative states that "Comprehensive, culturally-based, community-based approaches to life promotion and suicide prevention are known to hold the most promise"[7].

In the same vein, our approach maintains an alignment with Inuit Tapiriit Kanatami's National Inuit Suicide Prevention Strategy (NISPS), *Inuusivut Anninaqtuq*, Nunavut's Suicide

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[3] *First Nations Mental Wellness Continuum Framework*. Health Canada, Assembly of First Nations, 2015. Page 4. Web. 5 Feb. 2019.
[4] Ansloos, Jeffrey. *Rethinking Indigenous Suicide*. International Journal of Indigenous Health, 2018. Page 18. Web. 26 Feb. 2019.
[5] White, Jennifer and Christopher Mushquash. *We Belong: Life Promotion to Address Indigenous Suicide Discussion Paper*. Page 6. Web. 5 Feb. 2019. <https://wisepractices.ca/wp-content/uploads/2017/12/White-Mushquash-2016-FINAL.pdf>
[6] White, Jennifer and Christopher Mushquash. *We Belong: Life Promotion to Address Indigenous Suicide Discussion Paper*. Page 5-8. Web. 5 Feb. 2019. <https://wisepractices.ca/wp-content/uploads/2017/12/White-Mushquash-2016-FINAL.pdf>
[7] "System-Level Change for Life Promotion." *Wise Practices*. N.p., 2018. Web. 18 Feb. 2019. <https://wisepractices.ca/system-level-change/>

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Prevention Action Plan for 2017-2022 as well as with the First Nations Mental Wellness Continuum Framework, all of which are evidence-based holistic approaches which consider the entire lifespan of the individual with a special focus on nurturing healthy children[8] and creating a framework of support at the individual, family and community levels[9] while addressing the socio-economic conditions that affect the daily health and wellbeing of Nunavummiut[10] as the most impactful way to ensure that people are less likely to reach the point where they consider suicide[11].

These plans iterate on the importance of confronting social and economic inequities, childhood adversity, and mental distress, as well as historical and intergenerational trauma stemming from Canada's colonization of Inuit Nunangat[12] that create environments where risk for suicide multiplies[13]. For Inuit, creating equity "means eliminating unfair and avoidable differences in areas such as housing, education, and access to healthcare in ways that validate our language, culture and identity"[14]. As a result, these strategies outline a vision in which individuals, families, communities, organizations and governments work together to provide wide-reaching and meaningful services that are built on the values of *Inuit Qaujimajatuqangit*, the Inuit knowledge system and worldview, to prevent suicide and build healthy communities where children and youth can grow up in safe and nurturing environments[15]. Consequently, ITK places considerable emphasis on increasing protective factors and the development of resiliencies in youth through an "upstream" approach, which are those delivered early in life and continue to be protective into adulthood[16].

In responding to the above and maintaining a Smart Cities approach that leverages data and connected technology, our goal to promote life and positive mental health for young Nunavummiut is sought by increasing protective factors and contributing to social equity through community makerspaces that nurture wellbeing while addressing the digital divide in the North. As articulated in our challenge statement, we seek to increase the availability and accessibility of life promoting activities, resources and support systems like peer networks, educational initiatives and creative outlets to all Nunavummiut in the expanded field of data and technology - with a focus on building up community and individual strengths.

Makerspaces offer a gathering space for people to come together to be creative. In the past few decades, makerspaces have become a movement and a culture of individuals "using a mix of digital fabrication, open hardware, software hacking and traditional crafts to innovate

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[8] *Inuusivut Anninaqtuq Action Plan 2017-2022*. 2017. Page 9. Web. 5 Apr. 2018 <http://inuusiq.com/wp-content/uploads/2017/06/Inuusivut_Anninaqtuq_English.pdf>

[9] *First Nations Mental Wellness Continuum Framework*. Health Canada, Assembly of First Nations, 2015. Page 4. Web. 5 Feb. 2019.

[10] *Inuusivut Anninaqtuq Action Plan 2017-2022*. 2017. Page 11. Web. 5 Apr. 2018 <http://inuusiq.com/wp-content/uploads/2017/06/Inuusivut_Anninaqtuq_English.pdf>

[11] *National Inuit Suicide Prevention Strategy*. Inuit Taipiriit Kanatami: 2016. Page 9. Web. 29 Jan. 2019. <https://itk.ca/wp-content/uploads/2016/07/ITK-National-Inuit-Suicide-Prevention-Strategy-2016-English.pdf>

[12] *National Inuit Suicide Prevention Strategy*. Inuit Taipiriit Kanatami: 2016. Page 5. Web. 29 Jan. 2019. <https://itk.ca/wp-content/uploads/2016/07/ITK-National-Inuit-Suicide-Prevention-Strategy-2016-English.pdf>

[13] *National Inuit Suicide Prevention Strategy*. Inuit Taipiriit Kanatami: 2016. Page 5. Web. 29 Jan. 2019. <https://itk.ca/wp-content/uploads/2016/07/ITK-National-Inuit-Suicide-Prevention-Strategy-2016-English.pdf>

[14] *National Inuit Suicide Prevention Strategy*. Inuit Taipiriit Kanatami: 2016. Page 5. Web. 29 Jan. 2019. <https://itk.ca/wp-content/uploads/2016/07/ITK-National-Inuit-Suicide-Prevention-Strategy-2016-English.pdf>

[15] *Inuusivut Anninaqtuq Action Plan 2017-2022*. 2017. Page 5. Web. 5 Apr. 2018 <http://inuusiq.com/wp-content/uploads/2017/06/Inuusivut_Anninaqtuq_English.pdf>

[16] *National Inuit Suicide Prevention Strategy*. Inuit Taipiriit Kanatami: 2016. Page 25. Web. 29 Jan. 2019. <https://itk.ca/wp-content/uploads/2016/07/ITK-National-Inuit-Suicide-Prevention-Strategy-2016-English.pdf>

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for themselves, underpinned by an ethos of openness and skill sharing rather than commercial benefit"[17]. Makerspaces are also grounded in a "DIY" culture which embraces creation and sustainability and promotes skill-building and self-directed learning. They grew popular in the United States and Canada in the 1960's and 1970's and were aligned with civic and social movements of the time. Makerspaces also encompass an ethos of "hacking", understood as a practice of taking an object with a specific use and repurposing it; or "hacktivism", which involves the subversive use of computer programs and networks.

In a deeper way, the concept of hacking as it refers to practices of innovation and adaptation have been deeply embedded in Inuit history and culture for millenia; responding to change and social upheavals with teamwork, creativity, and consensus building. What is commonly referred today as 21st century skills like critical thinking and problem solving, innovation, creativity, collaboration and communication[18] have been and continue to be the very principles built into the guiding Inuit values called *Inuit Qaujimajatuqangit* or "The Inuit Way of Knowing". These are:

(a) *Inuuqatigiitsiarniq* (respecting others, relationships and caring for people);
(b) *Tunnganarniq* (fostering good spirit by being open, welcoming and inclusive);
(c) *Pijitsirniq* (serving and providing for family or community, or both);
(d) *Aajiiqatigiinniq* (decision making through discussion and consensus);
(e) *Pilimmaksarniq/Pijariuqsarniq* (development of skills through practice, effort, action);
(f) *Piliriqatigiinniq or Ikajuqtigiinniq* (working together for a common cause);
(g) *Qanuqtuurniq* (being innovative and resourceful); and
(h) *Avatittinnik Kamatsiarniq* (respect/care for the land, animals and the environment).[19]

We consider Makerspaces as an organic extension of this history and philosophy. Our proposal intends to create spaces for education that support Inuit values and skills like collaboration, creativity, critical thinking and problem-solving, while emphasizing relationships to the land and the environment.

In the article "Making Community: The Wider Role of Makerspaces in Public Life", the authors identify four broad themes that outline the different roles Makerspaces play in the wider community: acting as social spaces, supporting wellbeing, serving the needs of the communities they are located in, and reaching out to excluded groups[20]. They understand the potential of makerspaces as third spaces, or multi-dimensional social spaces separate from the home and the workplace that play a critical role in public life[21]. As a result, these spaces can

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[17] Taylor, Nick, Ursula Hurley and Philip Connolly. *Making Community: The Wider Role of Makerspaces in Public Life*. ACM, 2016. Page 3. Web. 15 Feb. 2019.
[18] *Ontario 21st Century Competencies*. Queen's Printer for Ontario, 2015. Page 56. Web. 17 Sept. 2018. <http://www.edugains.ca/resources21CL/About21stCentury/21CL_21stCenturyCompetencies.pdf>
[19] Education Framework: Inuit Qaujimajatuqangit For Nunavut Curriculum. Nunavut Department of Education, Curriculum and School Services Division, 2007. Web. 8 Jul. 2018.
[20] Taylor, Nick, Ursula Hurley and Philip Connolly. *Making Community: The Wider Role of Makerspaces in Public Life*. ACM, 2016. Page 35. Web. 15 Feb. 2019.
[21] *Ibid* page 10 Taylor, Nick, Ursula Hurley and Philip Connolly. *Making Community: The Wider Role of Makerspaces in Public Life*. ACM, 2016. Page 10. Web. 15 Feb. 2019.

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have an explicit agenda beyond digital or physical fabrication, intent on creating positive change in a community[22].

Our model for Makerspaces in Nunavut is focused on building pathways to life promotion and mental wellness for youth firmly grounded in Indigenous values by nurturing creativity, fostering agency, and building positive relationships while engaging in the expanded field of technology at the intersection of art, culture, science and education. The idea that connected and accessible digital technologies and resources for Indigenous communities create opportunities for intergenerational knowledge transfer, language learning, renewal, and revitalization through multimodal forms as pathways to mental wellness has gained considerable traction in recent years.

A 2013 report titled "Promoting Positive Youth Development and Highlighting Resources for Living in Northwest Alaska Through Digital Storytelling" describes a three year project that used digital storytelling as a health promotion strategy within a Positive Youth Development (PYD) framework. In this project, Digital Storytelling comprised the creation of 3-5 minute videos by youth that reflected aspects of their own life experiences. They selected and generated photos, wrote and recorded first-person voice-over narration, and learned through hands-on computer tutorials how to assemble the materials into a finished digital story[23]. The report concludes that "the digital storytelling project offered young people a way to gain a sense of personal mastery and achievement, highlight positive aspects of themselves, their lives and their reasons for living, as well as offering them a venue for strengthening connections with people [...] Digital storytelling presents a promising approach to health promotion and primary prevention that can be used to bolster cultural and identity-based protective factors needed for ushering marginalized young people into healthy adulthood"[24]. Although in this case digital storytelling is mostly focused on audiovisual techniques and materials, a variety of programs and technologies can be used to tell stories in dynamic and interactive ways, including with coding and game developing software like Twine and Scratch.

In the article "Supporting Self-Determined Indigenous Innovations: Rethinking the Digital Divide", authors Jasmin Winter and Justine Boudreau make a case for the potential of makerspaces as important initiatives that open up both physical and digital environments to project Indigenous worldviews and ways of knowing into the future of technology[25]. Specifically, the authors outline a case study that describes the efforts of the community of Pimicikamak First Nation (Cross Lake, Manitoba), who, during a state of emergency declared in March 2016 due to increased numbers of death by suicide, reached out to the uOttawa Richard L'Abbe Makerspace and partnered with its sister organization Maker Mobile to develop a strategy to empower Cross Lake youth through community-driven making[26]. This strategy involved the development of one week summer camps

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[22] *Ibid* page 10 Taylor, Nick, Ursula Hurley and Philip Connolly. *Making Community: The Wider Role of Makerspaces in Public Life*. ACM, 2016. Page 10. Web. 15 Feb. 2019.

[23] Wexler, Lisa, Aline Gubrium, Mehan Griffin, and Gloria DiFulvio. *Promoting Positive Youth Development and Highlighting Reasons for Living in Northwest Alaska Through Digital Storytelling.* Health Promotion Practice, 2012. Page 620. Web. 12 Jan. 2019.

[24] Wexler, Lisa, Aline Gubrium, Mehan Griffin, and Gloria DiFulvio. *Promoting Positive Youth Development and Highlighting Reasons for Living in Northwest Alaska Through Digital Storytelling.* Health Promotion Practice, 2012. Page 622. Web. 12 Jan. 2019.

[25] Winter, Jasmin and Justine Boudreau. *Supporting Self-Determined Indigenous Innovations: Rethinking the Digital Divide in Canada*. Technology Innovation Management Review, 2018. Page 44-45. Web. 10 Jan. 2019

[26] Winter, Jasmin and Justine Boudreau. *Supporting Self-Determined Indigenous Innovations: Rethinking the Digital Divide in Canada*. Technology Innovation Management Review, 2018. Page 45. Web. 10 Jan. 2019

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for youth that included curriculum on 3D modelling, 3D printing, coding, building structures on a budget, and making 3D printed jewelry, alongside the purchase of a 3D printer for the community - thus providing a source of engagement and a creative outlet for the community[27].

Another example of a community based initiative providing a STEAM (Science, Technology, Engineering, Art and Math) based model for exploration is *Wapikoni*, a Quebec-based mobile studio that travels to Aboriginal communities to provide workshops for youth that allow them to master digital tools by directing short films and musical works, through a methodology that develops self-esteem, skills and resilience[28]. Founded in 2003, their mission is to "combat isolation and suicide among First Nations youth while developing artistic, technical, social, and professional skills; broadcast films and various public awareness issues facing First Nations while enhancing a rich culture, too often overlooked; and contribute to the preservation of First Nations cultural heritage" [29]

Despite the temporary nature of these programs and the need for further study, the authors channel Dr. Julie Nagam's research in stating that "thinking about makerspaces in Indigenous communities should mean connecting contemporary Indigenous innovations to makerspace theories, and back to traditional Indigenous knowledge in a circular way that finds the common thread of community wellbeing"[30], while further adding that "as community spaces for innovation, makerspaces may serve as a point of discussion for how to encourage, for example, alternative pedagogies and educational practices to connect youth and elders to promote intergenerational knowledge transmission, [...] this could include building equipment for land-based education, hunting, and trapping, all the while encouraging language revitalization"[31]. Both of these examples are initiatives that draw on the strengths of Indigenous technology and innovation, grounded in their worldviews and methodologies, as pathways to mental wellness.

Our proposal builds on this evidence to focus on implementing permanent Makerspaces within each community in Nunavut as central community hubs for digital and STEAM-based activities that amplify Inuit Qaujimajatuqangit principles such as collaboration, creative problem-solving, and knowledge-sharing. At the same time, there is an opportunity to connect community makerspaces to each other and establish an important territorial network for innovation tied to life promotion.

We propose to centralize this network and provide the governance and project management framework for this initiative through the incorporation of a new organization, titled the Katinnganiq Makerspace Network, or KMN (which will be discussed in the Governance chapter).

Our goals are to improve wellness by teaching new skills, increasing self-confidence, improving sense of agency, fostering positive peer and adult relationships, connecting with culture and identity, and providing new creative outlets and nurturing spaces for all Nunavummiut. Curriculum, programs, and materials will prioritize and encourage the use of Inuktut to support language revitalization.

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[27] Winter, Jasmin and Justine Boudreau. *Supporting Self-Determined Indigenous Innovations: Rethinking the Digital Divide in Canada*. Technology Innovation Management Review, 2018. Page 45. Web. 10 Jan. 2019

[28] "History." *Wapikoni*. N.p., n.d. Web. 26 Nov. 2018. <http://www.wapikoni.ca/about/who-are-we/history>

[29] "Mission, Values and Objectives." *Wapikoni*. N.p., n.d. Web. 26 Nov. 2018. <http://www.wapikoni.ca/about/who-are-we/mission-values-and-objectives>

[30] Winter, Jasmin and Justine Boudreau. *Supporting Self-Determined Indigenous Innovations: Rethinking the Digital Divide in Canada*. Technology Innovation Management Review, 2018. Page 46. Web. 10 Jan. 2019

[31] Winter, Jasmin and Justine Boudreau. *Supporting Self-Determined Indigenous Innovations: Rethinking the Digital Divide in Canada*. Technology Innovation Management Review, 2018. Page 45-46. Web. 10 Jan. 2019

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Defining Community Makerspaces and Programs

The purpose of the Makerspaces initiative is to enable and empower youth resilience to embrace the future with confidence, armed with new coping skills and tools, and supported by positive relationships. The central focus of Makerspaces is on 'protective factors', where youth will build a personal sense of belonging, meaning, purpose and hope through their participation in activities. This initiative will provide safe, nurturing, welcoming social hubs for Nunavummiut that:

- **Provide imaginative and engaging programs:** including recreational, extra-curricular learning and skills acquisition (leadership, technology, interpersonal), the arts (performance, visual, music), traditional cultural/ language activities, peer mentoring, Elder mentoring, and coaching.

- **Leverage digital connectivity** where youth have opportunities to connect within communities and across Nunavut's 25 hamlets, share knowledge with each other and express themselves through access to digital tools and technological know-how utilizing new telecommunications technology.

- **Integrate community support**, including wellness services, where youth can access social/community services delivered on a 'whole person' basis in Makerspaces.

The above categories include the following series of activities that have been adapted from what was preliminary proposed.

- **te(a)ch Curriculum, Digital Literacy and Capacity Building**

As it concerns digital literacy and capacity building, our preliminary proposal included the te(a)ch curriculum as a deliverable through workshops programmes within community makerspaces in addition to online and digital access. That is still very much the case. As mentioned in our preliminary application, the te(a)ch curriculum is a free K-12 computer science program designed for Northern and Arctic communities in Canada with digital content and materials that are culturally responsive to Inuit, First Nation, and Métis ways of knowing.

The te(a)ch curriculum meshes a core learning focus of computer science fundamentals with game design, animation, and physical activity grounded in cultural exploration. It is a program with benefits that extend well beyond simply teaching "how a computer thinks". The goal is to implement equitable practices in digital literacy initiatives and harness the strength of Indigenous knowledge and ways of being to build agency and ownership in the use of technology as a creative tool in informed, safe, and positive ways. As will be discussed more in the technology chapter, the online launch of this program will take place early in March 2019 - and can be found here by clicking here.

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- **Digital Art and Arts and Crafts Programming**

Central to each makerspace is a foundation of arts and crafts programming that stimulate creativity and support each person's talents through skill-building and play. Each makerspace will have the curriculum and capacity for art and crafts based workshops that based in cultural practices and materials. As mentioned in our preliminary proposal, we wish to work on expanding digital art materials and curriculum to support self-expression and skill-building.

The infrastructure and environment of each makerspace will nurture play and experimentation where youth have the tools and knowledge to build and create their own experiences, in their own languages; with the Makerspace, its community network, and governing foundation having the staff and capacity to assist in the production and realization of youth-led projects.

- **Connectivity**

In our preliminary application we outlined the need to open up local communication portals for both youth and communities to connect to each other. Since becoming finalists of the Smart Cities Challenge, we have modified our original proposal from installing and maintaining mesh networks in every community to supporting initiatives like the Arctic Internet Exchange (expanded upon in the technology chapter), which have emerged as tangible avenues to improve connectivity in the North.

In the recent months, the connectivity landscape in Nunavut has shifted, and this change in our proposal has come out of research and consultation with our local networking partners Nunageek Solutions Inc and Nuvujaq into the implementation process of a mesh network within a community. The challenges identified for a hardware mesh (a mesh network with hardware nodes that creates a local area network) include the need for potentially thousands of nodes to create a successful mesh – in addition to making sure that every node has a power source and is installed, monitored and maintained properly – alongside a danger of falloff of nodes leading to area blackouts. As a project with massive logistics and a reduced capacity for IT and networking solutions in each community - the requirements for successful installation, monitoring and maintenance of mesh networks risks inflating and growing costs to the point of unsustainability.

However, in line with the values set out in this proposal, our approach will be to support capacity building and learning for individuals through makerspace programming and curriculum that addresses networking more generally (and mesh networks specifically if desired), alongside the appropriate tools for practice and prototyping – based on the expertise of networking partners Nunageek Solutions Inc and Nuvujaq.

Additionally, a digital platform for the Katinnganiq Makerspace Network (KMN) will be developed with a purpose to connect the community makerspaces and their members to each other to share knowledge, as well as to enable access to tools, resources and ongoing support for aid in building capacity among teachers and youth. This network and platform will support the exchange of ideas and knowledges between communities and individuals.

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- e-Mental Health Initiatives

We recognize that in our preliminary application we proposed to develop several e-mental health initiatives. Currently, some of those are no longer part of this proposal. First is the wellness chat, or community chat application system with the aim of enhancing peer support groups and contribute to maintaining communications between individuals. The Kids Help Phone, which operates a 24-7 phone line for crisis and support, recently launched a free crisis text line for Nunavut, making its services more available. This is in addition to the online chat service they also provide. These developments make our proposed chat application seem redundant. Our intention is to collaborate with others and support different initiatives rather than duplicate work[32]. To complement local health resources like those offered by the Kids Help Phone, we expect each Makerspace to be a connection to local mental health resources through staff trained in ASIST (Applied Suicide Intervention Skills Training) and Trauma informed practice - as well as a direct connection to other resources offered by the Embrace Life Council and local counselling services.

With regards to gamified interventions, the previously proposed localization of the SPARX game is being pursued by York University in collaboration with Pinnguaq Association, yet the source code has recently become proprietary of a private business - licensed to York University for research purposes only. This means we have no ownership over the source code and disqualifying this feature as a viable option to develop within the context of the Smart Cities Challenge. However the potential to build a piece of (gamified) software with the aim to instill Inuit-specific health values for youth through a digital delivery mechanism is still an unprecedented and transformative initiative. Though it won't be integrated as a firm deliverable in the context of this proposal, we expect that by working with youth at community makerspaces, we will workshop the vision for this piece of software, and work collaboratively to develop it as a resource.

As a whole, this initiative employs an evidence-based approach that is built on the feedback we have received from Mayors and community members, as well as from discussion and consensus reached within the collaborating organizations leading this proposal. These processes and conversations are further discussed in Chapter 6: Engagement. Throughout the past few months, the Pinnguaq Association has, as part of this proposal, opened and operated a Makerspace in Iqaluit. The portfolio of the Iqaluit Makerspace programs and events can be found in Appendix A.

Our is an ambitious project, essentially requiring 25 different tailored approaches to makerspaces that respond to each community's strengths and resources, phased out through a 5-year period - attainable through our proposed governance and project management framework, and measured through a culturally safe evaluation framework. We will work with each community to identify the space available and the appropriate agency to implement and manage their makerspace, highlighting a collaborative and community-led approach.

We recognize this is a competition and that only 2 of 10 proposals will be selected as winners in our category. We wish to acknowledge the important work of our fellow finalists - whose initiatives represent important solutions and responses to the challenges faced in their communities. We do not pretend to state that any proposal is more important than another - as each one stands strong and is validated in its own context. What we present throughout this

[32] *We will however, continue working with youth we began relationships with to mentor and support their practice.*

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document is a strategy that, based on extensive evidence and consultation, will be best suited to support the communities of Nunavut to implement the system-level changes required to promote and sustain individual, family, and community wellbeing.

Chapter 2: Governance

To achieve its ambitions, the Katinnganiq Makerspace Network (KMN) initiative needs a governance framework based on key guiding principles. The following principles have been identified through community and stakeholder consultation:

Rooted in Inuit Culture

- The governance model must support the unique Inuit worldview derived from language and culture, spiritual practices and relationship with the land within each local cultural context.
- Governance institutions should be built on existing organizational structures and expertise – including government, not-for-profit (NFP), and even private - wherever possible to enable rapid community level project start-ups.
- Youth and Elder voices should be placed at the centre of relationships with stakeholders.

Community-centric approach

- The governance framework must reinforce a community-driven, community-owned approach in creating Makerspaces, with decision-making and delivery authority vested in local communities.
- Local communities must define their specific needs and develop their own customized approaches to programming based on a principles-based, values-driven operational framework that supports flexibility.
- Local governance arrangements need to evolve within the overall governance framework as local capacities are built.
- Communities must have control over any data or research that profiles their community – in terms of control how it will be used and who has access to it.

Platforms for sharing among communities

- Platforms and practices should enable learning and knowledge-sharing across all participating communities, including research and lessons learned in delivering effective programming.
- Capacity and practices should enable communities to derive the maximum potential from existing and new/forthcoming communications capacity and applications.
- Finally, technology introduction must adapt hardware and software to the unique needs and culture of Nunavut communities.

A **values statement** provides a common set of fundamental beliefs for all Makerspaces managers, partners, stakeholders and participants. The preliminary values statement under consideration is the following: *Our work will be guided by openness in adapting new technologies to our Inuit cultural traditions in ways that create safe spaces to build resilience,*

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strengthen their cultural and spiritual beliefs and nurture the innovation skills youth need for strong futures.

This values statement and the proposed governance model and framework are built on the unique foundations of governance in Nunavut - where Inuit societal values and principles (IQ) drive development at all levels. Building the self-reliance of people and communities is a government priority and this governance proposal reinforces this priority.

Improved broadband communications will be important to the success of the project and is integrated into the governance model. There is important recent additions in satellite capacity serving the North, and within 3 years the contemplated new satellite infrastructure that is being deployed. This initiative plans to be in the forefront of taking advantage of new telecoms network capacity to deliver its programs.

This technology includes the latest geostationary satellite and the forthcoming low earth orbiting (LEO) infrastructure. Concurrent with the deployment of Makerspaces in communities by this Challenge project will be the development of community data centres. Their operational governance is an important part of this Governance Chapter.

The Katinnganiq Makerspace Network

Governance Framework

A holistic, multi-level governance model is proposed to ensure that internal structures, functions, processes, rules and relationship behaviours are values and principles-driven and are aligned with the direction, strategy and policies supporting Makerspaces. The governance model is community context-driven and multi-disciplinary. Providing options to youth that steer them away from negative behaviours towards positive options for building their own futures and that of their communities require highly integrated efforts. The silos of traditional support approaches simply do not address the 'whole person' in the context of the community and its worldview.

Governance Structure – Territorial and Hamlet Levels

A new organization called **Katinnganiq Makerspace Network** (KMN) will be created as the umbrella organization to serve the 25 hamlets involved with this initiative. It will be formally established as a not-for-profit organization, incorporated under federal law, and charitable status registration will be sought.

Its charter will be to implement the Smart Cities Challenge award and provide the platform for the co-management of Makerspaces in each community. It will act as a capacity-building and coordination support network for the hamlet-based Makerspaces. Its mission will be to provide each local Makerspace in the KMN with the tools, resources and training to support a culture of innovation firmly rooted in Indigenous values.

A unique feature of the governance model is the distributed nature of power across the 25 local level municipalities. It is envisaged that the hamlet or a self-determining delivery organization will be identified in each community, possibly an existing organization to enable rapid start-up. A new local not-for-profit will be created if a suitable organization does not

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exist. For the purposes of clarity, these local delivery organizations are referred to **KMN-L (for KMN-local).**

These organizations will be anchored by some formal indication of approval in principle by the local hamlet municipal authority, e.g. a resolution passed by the hamlet municipality. Then, the local Makerspaces delivery organization and the territory-wide KMN will enter into a formal agreement stipulating services to be provided and conditions to be met.

Thus, the structure will effectively be a 'bottom-up' governance model where the local delivery organization – each KMN-L - will be responsible and accountable for local activity. The delivery organization's governing body would be appropriately mandated; if a new organization is created, a new board of directors (and executive director) would be selected from local leaders in the hamlet[33]. The hamlet level NFP entity – KMN-L - will thereby become the "owners" and leaders of the initiative at the local level. Leadership will need to be carefully selected to lead the initiative and emerging leaders supported. Leadership in small communities is stretched, and individuals wear many hats.

The symbiotic relationship between the KMN and the KMN-L is to be a careful balance between them, each playing their respective roles under separate boards. The KMN will seek to harmonize efforts overall and share experiences through common management frameworks and support tools. The KMN will provide model KMN-L governance and business practices, financial and accounting systems, as well as training offerings and HR systems and the like. With improved connectivity and familiarity with communications platforms, sharing opportunities will be enhanced within local Makerspaces (KMN-Ls) as well as across hamlets.

KMN's Governing Board

The Katinnganiq Makerspace Network *governing board* membership will be between 9-15 members and directors will be appointed for four years[34].[1] The KMN board will include local community representatives and some Makerspace executive directors of local delivery organizations, i.e. the KMN-Ls. The development of Makerspaces and KMN-Ls in each community will come on stream over time as communities develop capacity. That should fill some of the KMN board positions. Once there are several Makerspaces, rotating delegates from the executive directors of hamlets will serve for fixed terms and will be drawn from the growing pool of KMN-L executive directors.

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[33] *It would be good governance for the locally elected hamlet council members not to be on the board of the local Makerspace authority, but in smaller communities with fewer board candidates, it may not be practical to exclude them.*

[34] *It is also proposed that the following Katinnganiq Board Committees shall be constituted - the Executive Committee, a Strategic Planning and Policy Committee, a Technology Adaptation Committee and a Development and Finance Committee. A board auditor will be appointed, supported by internal audit under the Development and Finance Committee. The board governance function will be carried out by the Executive Committee.*

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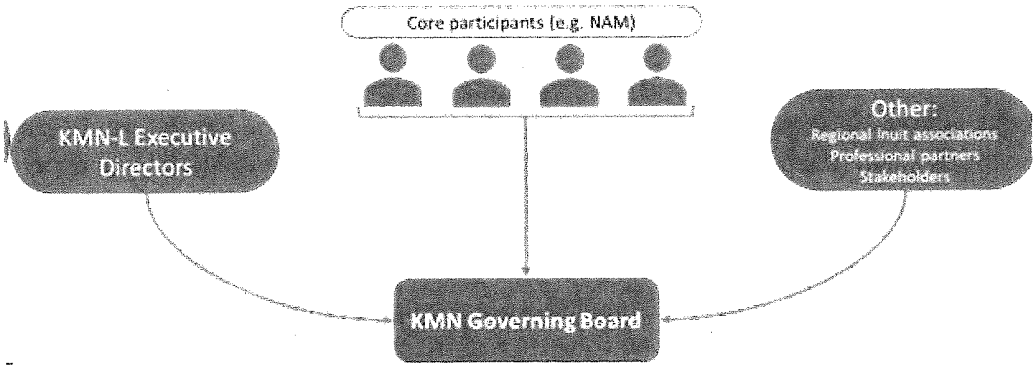


Figure 1: Constituents of the KMN Governing Board

Other members would be drawn from Territorial organizations and key stakeholder groups, e.g., professional, supplier and training organizations[35].[1] Regional Inuit associations and the Nunavut Association of Municipalities (NAM) can play representational roles. It is important that board members will be leaders and activists for Makerspaces within their communities and in doing so, will ensure strong connections between communities and KMN.

The board would likely meet face-to-face at least once per year, co-scheduled with the annual gatherings of all the municipal members of the Nunavut Association of Municipalities (NAM). While the board would govern the KMN, it could present annual progress reports to the NAM as to ensure good communication with hamlet governments as an important part of community engagement. The board will operate through communications platforms for other meetings. As shown below, the development of connectivity in response to third party investment in facilities is an important complementary part of the KMN initiatives.

The *board Chair* will be the point for accountability to and liaison with government(s) at all levels on all aspects of the Territory-wide relationship.

It is proposed that a transitional founding board of the 4 core organizations plus an independent interim chair be put in place for six months to one year while incorporation is secured. This start-up measure will ensure rapid building of the KMN governance structure and organization and provide for orderly recruitment of new board members as their key task, in accordance with the articles of incorporation.

Founding members personally will step aside as permanent members, at least in the board's first term or unless invited back by the permanent board. In future, the board chair will be selected by the permanent board members and officers from among its members. Similarly, an interim executive director should be appointed by the transitional board, leaving open the permanent board's prerogative to select its own executive director.

It should be noted that the Nunavut talent pool is small, and individuals serve in numerous ways in their communities. Issues of conflict of interest will require ongoing vigilance. Early policies need to be put in place to ensure integrity of the board and clarity on its duties to the corporation.

The *board's role* is to set the vision, mission and mandate for Katinnganiq. It will set the macro strategic direction, policies and priorities. It will provide planning and resource allocation

[35] *As a matter of good governance, Government of Nunavut representatives would not be candidates for board positions to represent the GN. However, nothing would prohibit them to be asked to serve on the board as private citizens.*

frameworks and allocate resources to communities. The board will develop guidance for engagement and relationships between Katinnganiq Makerspace Network (KMN) and the hamlet-based KMN-L NFPs.

The board will act as *trustee and administrator* for Smart Cities Challenge source of funds. It will commit to dispersing the funds to local municipalities via the incorporated not-for profit KMN-Ls – or to whatever community organization is to take responsibility for the KMN-L according to local circumstances. Transfer of funds would be as per an agreed formula (beginning with community governance readiness, and taking social indicators into account, e.g., number of youths, social conditions like delinquency rates, etc.). It sets out a system of quality assurance, monitoring and evaluation and reporting by hamlet-based KMN-Ls on their projects/programs.

As discussed in the *Performance Indicators* section, the board will monitor the performance of the KMN organization and hold the Executive Director (ED) accountable for overall performance and compliance on meeting the milestones and accountabilities established for reporting to Infrastructure Canada.

The KMN's binding agreements with the KMN-Ls (i.e., the local level Makerspaces) will include, inter alia, rents, salaries, purchasing and sourcing materials/supplies for the spaces. These agreements will include the operation of the telecommunications platforms, applications software, and computer hardware.

The board will be a visible and vocal advocate in Canada and elsewhere for identifying other sources of funds and partnerships, public and private, to secure sustainability for Makerspaces.

Essential to this relationship is the above initial statement of principles and values that will guide all relationship management relating to Makerspaces. They will empower communities with the flexibility needed to operate within these principles and are derived from and connect to *Inuit Qaujimajatuqangit*.

Advisory Board

The Katinnganiq board will appoint an Advisory Board (AB) to provide counsel on issues, assist in positioning the organization in their networks, and expanding the board of directors' circle of advice to non-Territorial residents. It will be composed of experts/researchers in the fields of behaviour and mental health, social measurement, youth programming, etc.

The advisory board is also a formal way to expand the community engagement network by engaging local community representatives, communications infrastructure specialists, youth, parents, and Elders. Government of Nunavut representative(s) will be invited to participate to facilitate harmonization between Katinnganiq and government policies and programs.

The AB chair and members will be nominated by the KMN board of directors for terms of 3 years. Issues may be referred to the AB, independent reports requested, and strategic insight solicited from it. It will set its own agendas and meeting times. It will be invited periodically to brief the KMN board on issues. It could be invited to provide environmental scanning as part of strategic planning. As an advisory board is discretionary, the number of members and meetings financed will be decided later by the KMN board of directors.

Executive Director of KMN

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The Katinnganiq ED will be selected by and reports to the board on implementing its strategy and supporting the board on all matters. The ED should be independent of core organizations and any interested party. However, for the initial founding period, one of the core organizers could be contracted to supply an ED, provided he/she reports to the board.

After the start-up period, a permanent ED will be appointed by the board with the caution that the ED's independence must withstand public scrutiny. However, the core organizations could still be contracted to supply needed expertise, if these contracts are on an arms-length basis. It is important for good governance that any form of self-dealing conflicts of interest are not allowed to grow, even if only through perception. See graphic below that illustrates the basic KMN structure.

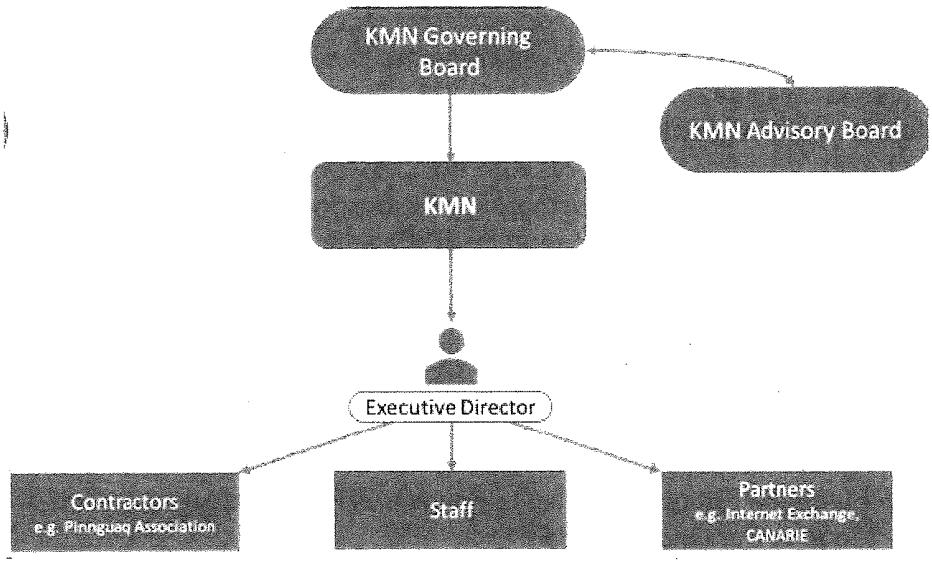


Figure 2: KMN Governance Structure

The board chair will enter into a formal MOU with the ED that lays out all duties and functions, roles and responsibilities, financial reporting and accountability requirements, annual business plan requirements, communications and issues management protocol, shared services, as well as privacy, conflict of interest, records management, audit and evaluation, and risk management. It will also contain terms of employment, compensation, liability and insurance provisions, etc.

It is the responsibility of the ED to lead the overall initiative and prepare reports for funders on the results of all work undertaken. In addition to supporting the board on the above, the ED is responsible for a research program, in conjunction with communities, to ensure that decisions can be taken based on evidence.

The ED advocates for **high bandwidth connectivity** and applications, and the training required for the communities to be equipped by resource people who can operate and maintain the expected data centres that will parallel the creation of community Makerspaces. The ED will work closely with other NFP service organizations and together will help develop capacity at the community level to operate local data centres and other technical infrastructure to fully enable the Makerspaces (the KMN-Ls).

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The ED will support territorial authorities as requested (e.g., Arctic College) responsible for connecting the Makerspaces in communities to the CANARIE network (see Technology Chapter). Agreements with NURN, which would be the territorial signatory to any registration with CANARIE, would trigger further investment in broadband facilities to Inuit communities – which would enable more cross community communication as well as interacting with the non-Nunavut world.

The ED **develops and delivers education and learning resources** to support communities in such areas as technology use and development, financial management (bookkeeping), general management and administration, teacher training and curriculum delivery, and leadership development. Training workshops and learning curriculum will be essential to help build capacity for making good use of the KMN support in learning materials, resources, start-up structures, equipment.

Promotion and public communications will be important to broad public awareness of Makerspaces. Such initiatives could include annual or biannual fairs or showcases that showcase youth makerspace group projects.

KMN-Ls as the Local Delivery Organizations

Effective delivery arrangements will be required to realize the ambition of KMN, and they are an essential part of the governance framework. The respective roles and responsibilities of local governments, partners and stakeholders in building this bold new multi-disciplinary, cross-functional model will be clearly set out for the 25 geographically dispersed hamlet communities and Katinnganiq Makerspace Network.

The KMN will develop the frameworks, tools, processes and mechanisms, resources to support a culture of innovation that is firmly rooted in Inuit values. This governance framework includes a similar management framework structured for the needs of the hamlet-based KMN-L level results. Accountability and reporting requirements are central even though each KMN-L partner has its own mandate and accountabilities, culture and internal imperatives and capacities. This means that flexibility is required for individual site innovations, while operating under a common vision, mission, values and ethics and operating principles (see Project Management section).

At the local hamlet level, there will very likely be a variety of not-for-profit organizations who will enter into formal delivery partnerships with KMN and the KMN-L. By community consensus, the KMN-L delivery organization will be organized in the best way to deliver effective local Makerspaces. The expected governance structure is pictured in the graphic below, while Appendix 1 provides an example of the variety of community organizations that already exist in a typical medium sized community.

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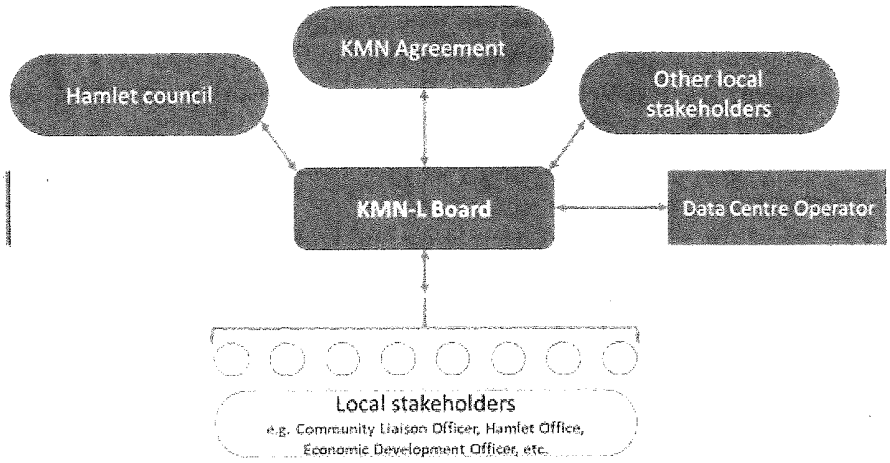


Figure 3:KMN-L Governance Structure

The Program Tools and Processes – KMN will develop tools to assist sites in developing and implementing Makerspace programs and projects. The purpose is to provide generic tools that can be adapted to local conditions and cultures:

- Broad Makerspaces guiding principles, a statement of common values and set of operating principles (to empower local sites with as much program flexibility as possible)
- Program policies and design frameworks
- Fundraising strategies and techniques (modules on achieving sustainability and value for money)
- Operations manual – including baseline operating procedures and sample Makerspace management and administrative structures/ functional responsibilities and arrangements charts, relationship management maps, personnel management including recruitment and development strategies/ generic job descriptions
- Planning, reporting and performance management systems including measurement metrics.
- A menu of generic programs and modules for communities to select from
- Training, development and delivery of programs
- Research and best practices
- Network equipment maintenance, procurement, and replacement contracting templates and procedures
- Agreements and contracting procedures for outside suppliers and NFP donations and services

Local leadership will need to be carefully selected to command the respect and moral authority needed for the initiative to succeed. Emerging leaders themselves will need to be supported by other local stakeholders as well as KMN. Small communities are stretched, and individuals wear many hats. As much as possible, therefore, KMN will work with local institutions and encourage collaboration to ensure the limited capacity in each community will

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become part of the Makerspaces – and their companion communications and computer troubleshooting, infrastructure maintenance.

The Katinnganiq Makerspace Network Partners and Stakeholders

Partners and stakeholders play essential roles in the governance model. The governance model recognizes that dynamic participation of local communities, as both partners (contributors of resources) and stakeholders (benefitting individuals, groups, organizations) is essential to the legitimacy and well-functioning of the governance model and outcomes of this initiative. Partners will play formal institutional relationship roles within Makerspaces as they will bring their home organizational insights to the board and Makerspace projects. Stakeholders provide the community opinion and insight as participants in consultations, as volunteers and as participants to steer Makerspaces to address local needs and concerns.

Roles and responsibilities of Core Katinnganiq Partner Organizations

Nunavut Association of Municipalities (NAM) – The group provides a single voice for mayors and municipal administrators of the territory's 25 communities. NAM will facilitate coordination with each community's involvement and help manage KMN's activities through its board position. NAM's day to day relationships with local communities will be indispensable in the communications to and from the local hamlet councils.

The Pinnguaq Association – Pinnguaq is a not-for-profit organization whose mission is to embrace and use technology as a means of unifying and enabling Nunavummiut and Indigenous people in Canada. It has established the Iqaluit Makerspace and developed key program components expected to be adopted by the local Makerspaces, e.g. the Te(a)ch curriculum. Pinnguaq will provide on an arms-length contractual basis support for the activities under the direction of the ED - who will be hired by the board. Pinnguaq's contracted services will embrace technology, training, and organization of the activities to be adopted by the Nunavut communities.

The **Isaksimagit Inuusirmi Katujjiqatigiit Embrace Life Council** – is a non-profit suicide prevention organization based in Iqaluit. The Embrace Life Council will provide the strategic direction for the development of the proposal in relation to the identified objectives and the need to grow the protective factors that reduce the inclination for youth to harm themselves. It will establish protocols for providing services to the communities, which will be offset by payments to compensate the Embrace Life Council for its services at rates established by the board.

Qaujigiartiit Health Research Centre (QHRC) - The goal of QHRC is to enable health research to be conducted locally, by Nunavummiut, and with communities in a supportive, safe, culturally-sensitive and ethical environment. It also promotes the inclusion of both Inuit Qaujimajatuqangit and western ways of knowing and understanding wellness to address health concerns, create healthy environments, and improve the health of Nunavummiut. The QHRC will continue its research and development of mental wellness resources from a trauma-informed perspective and will offer its services to help structure programs and an evaluation framework of KMN activities.

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Relationships with Key Stakeholders and Partners

A mapping of partners and stakeholders with direct and indirect stakes in Makerspaces demonstrates the complexity of arrangements required. As an 'eco-system', all the parties are interconnected with each other in a network of adaptive, interacting organizational partnerships, depending on each other to leverage the transformational change that is essential for survival.

Regional Inuit Associations - These association fall under the Nunavut Land Claims Agreement as non-profit organizations with roles that span all aspects of Inuit society. They manage land, provide social services, monitor environmental policy, and operate for-profit development corporations that invest in wealth-generating capital.

Hamlets and Service Organizations – Collaborating local organizations and governments will contribute to the cross-functional nature of this initiative. Services are often delivered by separate government and non-profit agencies alike – and their lack of coordination is often to the detriment of youth. This KMN initiative provides an opportunity to integrate efforts and resources locally to benefit youth. The 'whole person' approach to serving youth means that health, social service providers (governmental and non-governmental), recreational organizations, etc. can work together on local programming through Makerspaces.

NGOs and Non-Profits - Churches and other NGOs like education institutions, health organizations, social-serving organizations, arts and cultural organizations, could become supporters and partners with the KMN and with local Makerspaces themselves.

Private sector funders – Funding partners could be afforded the opportunity for representation on boards of local Makerspaces or KMN. Pinnguaq often plays the role of a facilitator, recently with Google's visit to Nunavut wherein Pinnguaq helped the delegation from Google understand how their CS First curriculum fits Nunavut's internet context. Pinnguaq also maintains a partnership with Canada Learning Code which hosts monthly workshops at the Iqaluit makerspace.

Federal Government - The federal government is a key partner and the accountability relationship with it will respond to all terms and conditions of funding. As elected governments are responsible and accountable to citizens for policies and expenditures, this proposal is highly sensitive to this requirement.

Government of Nunavut - GN will continue to play a key role to play in supporting self-governing, sustainable communities that serve the social and cultural needs of residents as it supports Nunavut's economic growth and social, cultural and environmental well-being. Makerspaces will be carefully aligned with policies and programs of the GN.

Other organizations - see Appendix 1 for sample list of local organizations in one sample, mid-sized community.

Community control over data and information

The KMN's purpose will be to connect the community makerspaces to each other to share knowledge, as well as to enable access to tools, resources and ongoing support for building capacity among project leaders and youth. The KMN will include a digital platform to

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provide ongoing support for local makerspace, a platform which will evolve as the Nunavut communications infrastructure improves with added satellite capacity.

As noted above, KMN will work with the Arctic Internet Exchange to support the improvement of broadband capacity concurrently with agreements with local communities to establish a Makerspace. While it will vary from community to community, the objective will be to co-locate data centres and Makerspaces, and to arrange for their maintenance. Efforts will be made to ensure the integration of these two activities and organize single teams to manage and maintain the Makerspace and data centre facilities. Doing so will help economize on the draw on human capacity in hamlets and provide more stable and meaningful employment opportunities.

A further network objective will be to arrange for connectivity between each Makerspace and the Nunavut Research Network (NURN)– which will provide the connection to the CANARIE network. To do so will require approvals of the GN and its Arctic College, which would be a recognizable entity for CANARIE. The KMN's Digital Platform will offer be discussed in Chapter 5: Technologies.

Risks

While the core members of the proposed KMN have extensive experience in Nunavut, and in undertaking similar projects, there are always risks which should be identified and mitigation strategies developed. Some of the major risks and appropriate mitigation strategies are identified:

Underperformance on program achievements leads to lower confidence or trust by local stakeholders:

- Provide support to ensure that local decisions are realistic and well-planned for.
- Provide regular stakeholder briefings/updates to ensure knowledge gaps do not develop.
- Ensure that key stakeholders are involved in delivery and advisory functions, particularly youth, Elders and parents.

Local conflicts and consensus hamper progress

- Build formal approval procedures that place consensus at the centre of key decisions.
- Ensure the right stakeholders are at the table.
- Provide training in alternative dispute resolution and if appropriate, establish a veto right of the local organization in event of stalemate on major decisions (when it will get used, how and who will use it).

Concerns over procedural fairness by Katinnganiq Makerspace Network in allocating resources to local communities

- Be transparent as to the criteria to evaluate among different projects and to the process for arriving at the allocation decisions.
- Ensure that key decisions are taken by the board, on the advice of administrative staff – and that if affecting specific communities that the local board is properly consulted.

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- Ensure that the board is comprised of the right key individuals capable of taking collective or difficult decisions.
- Establish an Executive Committee of the board that thoroughly examines any issues of procedural fairness and recommends a course of action to the Board of Directors.
- Ensure conflict of interest procedures are established for recusal as necessary.
- Create a board by-law in event of stalemate that provides for a deciding vote.

Delivery bottlenecks caused by local capacity limitations

- Well-planned, practical program/project implementation that takes account of capacity limits and plans accordingly;
- Timely training and development;
- Succession planning so that key skills/competencies can be drawn upon in event of staff turnover;

Crises, and/or other community tragedies draw leadership or delivery attention away from this initiative

- Contingency plans in place early on for rapid communication responses, local spokespersons, etc.;
- Ensure "twinning" of key individuals so that there is always a back-up individual to step into any Makerspaces governance roles in event of crisis or emergencies.

Shortage of financial resources stalls implementation

- Provide a nominal annual budget to communities to support core activities.
- Require clear planning frameworks from communities that manage cashflows.
- Proactive efforts to identify additional funding;

Chapter 3: Performance Measurement

This Chapter sets out the performance measurement model that will demonstrate how Katinnganiq Makerspaces Network (KMN) will be held to account for results achieved in implementing its vision and mission. Measuring results is a key accountability of a board and is the central part of a performance management system. The metrics established to assess whether planned results occurred, and desired outcomes are being achieved are essential to a board's credibility and accountability to its funders, stakeholders, clients and partners.

Performance measurement is part of a broader performance management system with interdependent elements. The responsible and accountable entities are the KMN and the other three core participants – NAM, etc. The local Makerspaces (KMN-Ls) are integral components to the success of the initiative but are not directly accountable to the Smart Cities Challenge program.

Local Makerspaces will be supported by the Katinnganiq Makerspace Network, that provides centralized support, coordination, development and project management tools, communications technology platforms and networks, research and training to Makerspaces. As such, KMN can be viewed both as a key **activity**, as well as a critical **input** to the success of local Makerspaces.

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Performance Measurement Challenges

In considering a methodology for performance measurement, the following characteristics were deemed important pre-conditions for this initiative:

- Practical and easily understood performance measurement by the community-level delivery partners, i.e. the local Makerspaces
- Results achievable by communities
- Research and fact-based framework
- Low cost, simple data collection requirements for indicators and measurement tools
- A design that works backwards from the "outcomes ('ends') we wish to achieve to the goals we set and activities ('means') we do"
- Consistent with the values set out for this initiative
- Priorities-focused (simple, cautious about overreaching and risk of failure)

Our goal is to promote life and provide positive interventions for improved mental health that (i) build capacities for young Nunavummiut,(ii) promote community ownership over Makerspaces, including providing the appropriate physical spaces, and (iii) improve youth access to digital and communications technologies. The major challenge is to link activities to affecting these ultimate outcomes, given that there are so many dimensions and causes for youth capacity, community wellness, and digital acumen[36].

Significant research has been undertaken and this proposal builds on known factors that encourage well-being in youth. The National Inuit Suicide Prevention Strategy developed by Inuit Tapiriit Kanatami, lists **six objectives to reduce major risk factors**, while improving major safety and protective factors: (i*) Create social equity, (ii) Create cultural continuity; (iii) Nurture healthy Inuit children; (iv) Ensure access to a continuum of mental wellness services for Inuit; (v) Heal unresolved trauma and grief; and, (vi) Mobilize Inuit knowledge for resilience and suicide prevention*[37]. Makerspaces' interventions will address all of these either directly or indirectly.

In recognizing that suicide is a complex issue, this initiative invests in protective factors through a 'life promotion framework' to reduce the risk of youth suicide in Nunavut. Our focus is on creating both physical and digital spaces that offer opportunities for Nunavummiut to connect with each other, learn skills, share knowledge, be creative, and express themselves in safe environments - as pathways to mental wellness. This focus springs from what can be called the **theory of change** – that life promotion in the manner outlined will positively affect the wellness of youth in Nunavut in years to come.

Our approach to **building protective factors**, understood as abilities, skills, and social supports that offer people the ability to cope with stress and spring back from crises and

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[36] *Inuit Taipiriit Kanatamit states that achieving social equity with other parts of Canada is necessary to prevent suicide, as is strengthening 'protective factors'. Of the 11 Inuit 'social determinants' of health (Quality of Early childhood development, Culture and language, Safety and security, Education, Availability of health services, Mental wellness, Environment, Livelihoods, Income distribution, Housing and Food Insecurity), a number are beyond the scope of this project Livelihoods, Income distribution, Housing, Food Insecurity); as for the others, it is important to note that Makerspaces are but one of many possible inputs,*

[37] *National Inuit Suicide Prevention Strategy*. Inuit Taipiriit Kanatami: 2016. Web. 29 Jan. 2019. <https://itk.ca/wp-content/uploads/2016/07/ITK-National-Inuit-Suicide-Prevention-Strategy-2016-English.pdf>

trauma[38]- lies in understanding the risk factors for suicide in Inuit communities and how they add up to cause distress[39]. Research states that the risk factors and high numbers of suicide in Inuit communities correlate with the historical trauma from colonial violence, including dispossession, culture loss, and social disconnection[40]. The Inuusivut Anninaqtuq Action Plan states that "Inuit are **not** predisposed by virtue of their ethnicity to be at a higher risk of suicide than non-Inuit"[41]; indicating that legacies of colonial violence are the root cause of social inequities that affect Inuit[42].

Our proposal for implementing digital literacy initiatives as well as improving networking infrastructure and enabling new creative outlets based on technology are **important protective factors** that relate to and are aligned with the above objectives. As defined by authors Jennifer White and Christopher Mushquash, protective factors refer to experiences that "appear to reduce the likelihood of suicide despite exposure to risk"[43]. Some of the protective factors identified by White and Mushquash as key cultural and institutional practices, can strengthen social relations and promote resilient outcomes for Indigenous communities. They include:

- coping and problem-solving skills;
- experience with success;
- sense of belonging and connection;
- social support;
- interpersonal competence;
- support and acceptance;
- revitalizing language and traditional healing;
- enhancing cultural identity and spirituality;
- enhancing local control and community self-determination;

While there is a challenge to attribute Makerspace activities to the development of protective factors, Makerspaces and their programming in Inuit communities can have some effect on most if not all the factors above; and they can be used as measures to determine impact. Other research on building resilience adds other promising factors, such as optimism, altruism (helping others), faith and spirituality, humor, having a role model, social supports, facing fear, meaning or purpose in life (one believes one has a purpose), and training[44]. All together they represent a sound basis for developing performance measurement indicators.

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[38] Alianait Inuit Mental Wellness Action Plan. Alianait Inuit-specific Mental Wellness Task Group. Web. 7 Jan. 2019. <https://www.itk.ca/wp-content/uploads/2009/12/Alianait-Inuit-Mental-Wellness-Action-Plan-2009.pdf>

[39] *National Inuit Suicide Prevention Strategy*. Inuit Taipiriit Kanatami: 2016. Page 11. Web. 29 Jan. 2019. <https://itk.ca/wp-content/uploads/2016/07/ITK-National-Inuit-Suicide-Prevention-Strategy-2016-English.pdf>

[40] Kral, Michael J. "Suicide and Suicide Prevention among Inuit in Canada." *Canadian Journal of Psychiatry*, 2016. 688 - 695. 3 Apr. 2018. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5066555/>

[41] *Inuusivut Anninaqtuq Action Plan 2017-2022*. 2017. Page 5. Web. 5 Apr. 2018 <http://inuusiq.com/wp-content/uploads/2017/06/Inuusivut_Anninaqtuq_English.pdf>

[42] *According to Inuit Taipiriit Kanatami's Inuit Statistical Profile of 2018, 52% if Inuit in Inuit Nunangat live in crowded homes (as opposed to 9% of all Canadians), 34% of Inuit aged 24-64 in Inuit Nunangat have earned a high school diploma (as opposed to 86% of all Canadians of the same age range), 70% of Inuit households in Nunavut are food insecure (as opposed to 8% of all households in Canada), and $23,485 is the median before tax individual income for Inuit in Inuit Nunangat (as opposed to $92,011 for non-indigenous people in Inuit Nunangat).*

[43] White, Jennifer and Christopher Mushquash. *We Belong: Life Promotion to Address Indigenous Suicide Discussion Paper.* Page 6. Web. 5 Feb. 2019. <https://wisepractices.ca/wp-content/uploads/2017/12/White-Mushquash-2016-FINAL.pdf>

[44] "How To Measure Resilience: 8 Resilience Scales For Youth & Adults." *Positive Psychology Program*. N.p., 13 Aug. 2018. Web. 14 Sept. 2018. <https://positivepsychologyprogram.com/3-resilience-scales/>

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The **conclusions** we draw from research guide our results definition and performance goals in our performance framework. We conclude that most measures of youth well-being require a broader set of indicators than this initiative can practically measure. Many are factors are well beyond the scope of Makerspaces activities and endeavours (poverty, food insecurity, school bullying, overcrowded housing, abuse, etc.). Therefore, we need to blend factors from different research sources that are more directly related to the type of programming local Makerspaces can reasonably provide. It must be recognized that Makerspaces and their activities will be but one input into these complex factors influenced by so many other aspects in the life of a youth. However, the factors selected for Makerspaces will be further vetted by mental health professionals as contributing to youth well-being and focused specifically on building the resilience youth need to adapt to life's challenges.

Finally, it is recognized that building youth resilience needs to be tackled earlier in life. While the main Makerspaces focus is on programming to support the youth experience, we will be exploring complementary programming for young children, for whom "Self-esteem is, at root, a measure of children's judgment of their own worth"[45]. Early childhood learning and child-parent digital literacy are entirely appropriate additions to this initiative, such as the e-learning for K-12. Further culturally relevant extra-curricular digital learning tools will be explored for including children through existing, proven off-the-shelf programs like Aboriginal HIPPY[46] - which could be brought into Makerspaces as a complementary activity.

Performance Measurement Methodology

This proposal adopts a Results-Based Accountability (RBA) model to assess how the vision and mission are reflected in outcomes. The performance measurement framework below will guide this work:

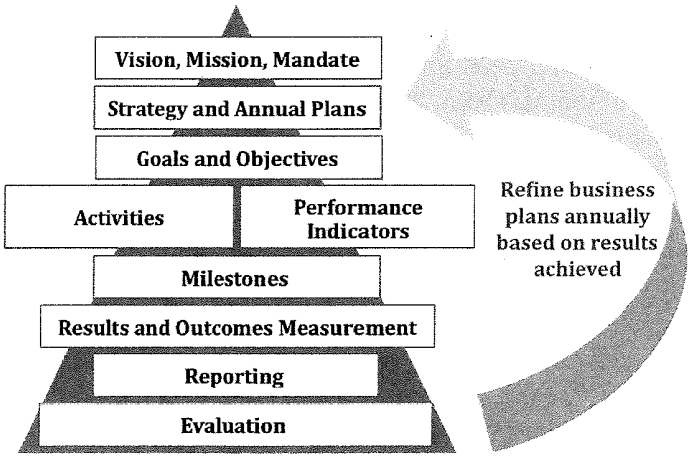


Fig 1: This image illustrates the RBA model

[45] "Nurturing Children's Self-Esteem Introduction." *MentalHelp.net*. N.p., n.d. Web. 20 Jan. 2019. <https://www.mentalhelp.net/articles/nurturing-children-s-self-esteem-introduction/>

[46] "Aboriginal HIPPY in Canada." *Mothers Matter Centre*. N.p., n.d. Web. 16 Oct. 2018. <https://www.mothersmattercentre.ca/aboriginal-hippy/>

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From the vision articulated earlier in the Introduction Chapter, RBA begins with articulating desired 5-year outcomes and works backwards to set goals and supporting activities and define key performance indicators (KPIs) where progress can be tracked and measured for success. **KPI metrics** are proposed that focus on three areas:

- the youth experience (improved outlook, participation, and skills acquired);
- how well communities are supporting their local Makerspaces – and vice versa - as a secondary outcome (community support and participation, search for on-going funding, volunteering); and
- progress in learning and utilizing digital skills (adoption by youth, diffusion throughout the community, understanding the value of leveraging data and connected technology in such applications as Indigenous story-telling, culturally relevant games).

The approach of increasing protective factors and encouraging positive social participation through community Makerspaces will both nurture wellbeing while addressing the digital divide in the North. As articulated in our challenge statement, this proposal will use data and connected technology to increase the availability and accessibility of life promoting activities, resources and support systems like peer networks, extra-curricular educational resources, and creative outlets to all Nunavummiut.

Outcomes measurement will focus first and foremost on youth and their personal perceptions of their experiences with Makerspaces. Makerspaces will provide multidisciplinary interventions that focus on the 'whole person', to the extent possible. The observations of Makerspaces leaders and mentors who work with youth are central to measuring progress. And as collective identity is a unique part of Inuit culture, community input will also be important in recognizing success of Makerspaces. Secondly, the performance of communities in supporting Makerspaces will be assessed. Commitment to integrating Makerspaces into communities, engagement through participation, and the ability to secure on-going funding will be included. Finally, the adoption, diffusion, and impact of greater bandwidth access and new digital platforms will be addressed as a third outcome.

It is important to note that performance measurement will not track rates of death by suicide per se as a performance measure due to the multiplicity of determinants. Rather, the *'embrace life'* approach isolates certain variables that do ultimately contribute to social equity. Building youth capacities is the central purpose of Makerspaces. Therefore, outcomes measurement needs to adopt a personal approach where the life of every individual youth is honoured in the calculus of impact.

Assessment measures of change recognize that **social change will occur only incrementally over time**. Measures adopted will not specifically address the standard short, medium- and longer-term perspectives, but rather identify Stage One, Stage Two and Stage Three outcomes. This approach is proposed because length of time may not be the best measure of the *effect* of the outcome. As well, long-term outcomes are likely beyond the scope of measurement in terms of Makerspaces ultimate impacts on social equity. That would take the development of a longitudinal data base extending over generations of youth – which may well receive support and be implemented but is beyond the scope of the Challenge's program.

This initiative is ultimately about **strategic change and a change management** approach needs to be built into the strategic plan. Employees, contract personnel, leaders, partners and

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stakeholders as well as organizations in general need to be equipped to understand and manage the changes that are occurring. Tools, processes, understanding respective roles and interrelationships, and excellent communications about the change process are essential to good management of change. Different ways of doing things or seeing can be threatening to some people and sensitive leadership is needed to allay concerns and recruit champions of change. A formal change management team can be identified and change champions such as vocal parents, articulate youth, other community leaders can help 'walk the talk' within communities to actively keep supporters on side.

Identifying change and drivers in the external environment is a starting point for strategic planning. An environmental assessment can provide a baseline starting point to describe the current situation assessment from which planning will evolve and the factors likely to influence future efforts. It should be noted that due to the staged implementation of Makerspaces in the 25 communities, each will proceed on its own pace due to local circumstances.

The Goals and ultimate outcomes

Makerspaces goals proposed follow the 'SMART' rules of being specific, measurable, attainable, relevant and time-specific. Below is a table of our three overall goals and ultimate outcomes. The outcome is a five-year and beyond state of being that Makerspaces aspire to:

Overall Goals		Ultimate Outcomes
Youth are active in Makerspace 'life	→	**Capable Youth**
Communities support well-run Makerspaces	→	**Permanent, connected, safe Makerspaces**
New digital technologies are effectively used	→	**Reduced digital divide for youth**

Project activities and Links to outputs and outcomes

Activities and their inputs and outputs are linked in an integrated manner as illustrated in the graphic below. The goals will be achieved through effective implementation of the workplan for the initiative as well as a constant attention to whether the outputs are driving the targeted outcomes.

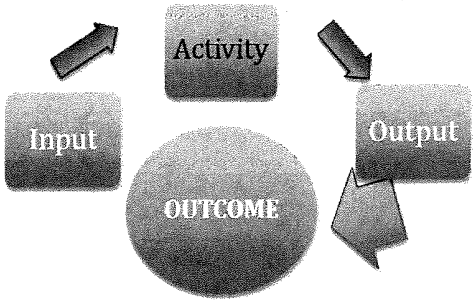


Fig 2: This image represents the input, activity, output, outcome cycle

The Makerspace programming menu adapted from the activities proposed in our preliminary application is described in the Vision Chapter, some of which are further elaborated on in the Technology Chapter. These activities will leverage the benefits of data and connected technology whose operations consist of further activities to be measured. They have been reviewed and revised in response to the feedback received at the Nunavut Association of Municipalities (NAM) AGM.

The Key Performance Indicators

Key performance indicators (KPIs) are presented below and follow the three goals and activity categories identified above. Both qualitative and quantitative KPIs can be constructed from the ones below, as long as data records are kept, and other indicator data are collected and made readily accessible for analysis. As noted above, while data is available regularly – even monthly in many cases – some long-term outcomes can only be shown long after the early participants have been through the program.

Outcome - Capable Youth

Youth capabilities will be measured and assessed through observation, assessment tools, questionnaires and one-on-one interviews, descriptive reports, participant observation, survey evaluation, sharing circles, journaling and voice/video recordings. As well as these more formalized processes to gather input, each KMN-L will be encouraged to establish a "youth council" or some other way for youth to channel feedback as to the effectiveness of the local Makerspaces.

A Personal Growth Chart will be prepared for each participant, the contents of which are a joint project between the Makerspace leader or designated mentor and individual youth. Although data and information will be stored in local data centres, it will be strictly subject to privacy rules. The Growth Chart will use the following indicators and measurement approaches as follows:

Indicators	Measurement
Has acquired new skills and activities	Engages in program activities; Expands number of activities engaged in; Shows proficiency in new skills – coping, technology, language, technology skills; Excels in one or more activities; Has career goals
Has a role model or mentor(s)	Seeks out help and support
	Listens to Elders/other role models
Established new social connections	New friends and peer groups
	Participates in communities of interest
	Participates in peer circles

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	Intergenerational connections to work with Elders
Has a strong sense of belonging to the community	Participates in traditional cultural and language activities, including storytelling and games
	Participates in community affairs
	Exhibits leadership
Has a positive self-identity	Optimism for the future
	Good self-esteem
	Pride of self
	Feels empowered
	Expresses opinions and speaks out
	Demonstrates self-confidence
	Good eye contact
	Care in personal appearance
	Can define personal values
Perceived progress overall by community	Multiple perspectives: Elders, youth, community leaders, parents, academic institutions, hamlet, teachers

Outcome - Well-run Makerspaces actively supported by communities

Local Makerspaces will be developed through extensive consultation with each community, and community buy-in is a necessary condition to succeed. For the program to succeed, the Makerspaces need to be supported by their communities. At the same time, the way to do this for the Makerspaces is to support the communities – it is a two-way street. KPIs will be developed from the following indicators and measurement approaches:

Indicators	Measurement
Financially self-supporting	New business partners come on board with firm, planned commitments in cash and in kind
	Alternate sources of funding identified and funding streams in place
	Sound funding projections in place to sustain Makerspaces when federal funding ends
	Growing numbers of active community volunteers, partners and stakeholders and participating youth

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	Makerspaces established in all 25 communities
	Meets or exceeds evaluation criteria
	Positive public reports' feedback (exit survey from public presentations)
Increase in community volunteers, partners and stakeholders and numbers of participating youth	Number of youth attending programs at each space, broken down by activity
	Number of volunteers
	New funding/program content partners
	Active community stakeholders on advisory committees, in community consultation sessions
Makerspaces established in 25 communities	Orderly start-ups based on a readiness assessment framework
IMAGINE Canada accreditation of KMN	Plan for certification of good management

Outcome - Effective Use of New Technologies:

The focus is on youth utilization of information technologies, but as they are also members of communities and as their communities are committed to their well-being, of support, measures will include community adoption as well. For example, Elders will learn alongside youth, community data centres can have other uses, and technological learning can be infused as part of a local community's culture. Indicators and measurement approaches proposed are shown in the following table:

Indicators	Measurements
Digital literacy and Learning Practical Skills	Availability of extra-curricular learning tools and resources
	Accessibility of material in Inuktitut
	Offline and Online Accessibility
	Relevance of learning curricula to users
	Relevance of learning tools to users
	Digital art and creative software/applications
	Connection to culture and traditional knowledge
Reduced digital divide	Improved strength of network infrastructure: • Reduced latency • Increased local traffic

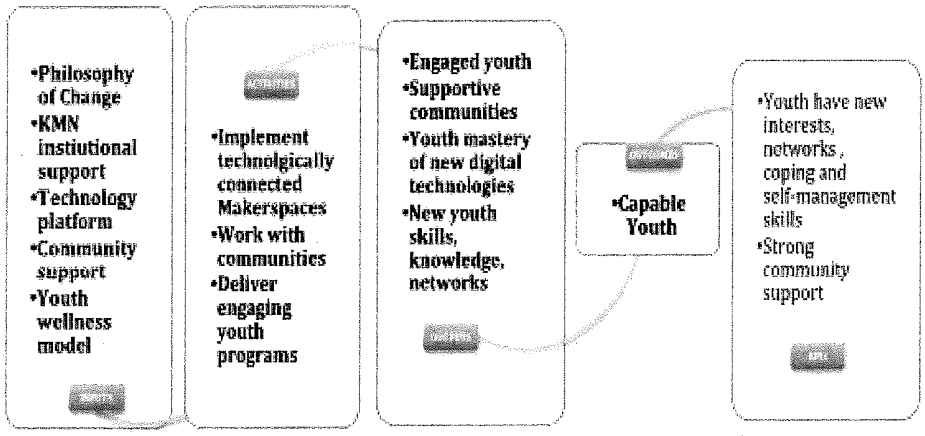
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	Internships and job opportunities in technology
	Digital literacy and Learning Practical Skills
	Digital art and creative software/applications
	Active and positive participation in social media
	Greater creativity in using digital art, games, and story-telling
Increased opportunities to learn and share knowledge, ideas, and know-how	Skills in team working and adopting different roles
	Reverse teaching of digital skills to the elders
	Improving skills in trouble shooting and self-initiative
	Supporting the community through other applications
	Sharing skills, knowledge with other Makerspaces

Logic Model

The following images and tables represent the logic model for this initiative, drawing on the KPIs discussed above and the main work streams for the initiative (see Project Management Chapter). As such, they identify the **inputs, activities, outputs** and their **KPIs,** and the **outcomes** and their **KPIs.** As noted in the instructions to bidders, while these tables present the approach that best fits this initiative – with outputs and outcomes matching each activity - we have respected the requirements for the Performance Measurement Chapter. They are high level and individual KPIs at a more detailed level would be developed from the indicators listed above.

The macro evaluation logic model is presented below:



This image represents a Makerspace MACRO input-output model

For a list of milestone, deliverables, timelines and payment schedule, **please see the section on work streams and work breakdown structure and in Chapter 4: Project Management.**

Inputs	Activities	Outputs	KPIs	Expected Outcomes	KPIs
Activity Focus: KMN Start-up and Operations					
Application participants and pro tem core board members of KMN	Set up Physical Office	Lease signed, network hooked up; publicized move in	Documents for lease, operations Media coverage	High awareness generated for program launch	Positive broad reaction in Nunavut
	Assess capacity and create roll-out plan for communities	Capacity assessment template and system; relevant data acquired; realistic roll-out plan prepared	Accuracy of the data and hamlet assessment	Sets a model for rest of program life, although updated regularly	Accuracy in judgment of communities selected
Local community institutions and leaders	Engage with hamlets and gain commitment – agreements struck	Outreach to all hamlets Listen and revise approach Negotiations with reps from hamlets	Introductory communications to all 25 hamlets MOUs with some hamlets	Positive rapport struck with at least half the hamlets	At least 2/3 of communities show strong interest
Challenge program officials	Negotiate Charter with Challenge Program	Signed contract with performance measurement system and payment schedule by deliverables	Satisfies KMN's cash flow requirements Realistic deliverables	Good communication and rapport established Data capture, reporting practices & established	Initiative operating smoothly with trust relationship
Professional and technical suppliers and stakeholders	Constitute, staff, and incorporate KMN	Interim board, ED, and key staff and register non-profit incorporation	Individuals appointed and incorporation documents submitted	Board and staff model broadly lauded, and operate effectively	KMN starts on the right track ascertained by stakeholders
	Establish KMN operational systems	Put in place office systems, staffing, technical plans, Makerspace packages - complete with support guides for Makerspace space, training, and local organization documents	Installed systems run smoothly Training completed for implementing KMN-Ls	Meet early milestones in creating KMN-Ls with sustained positive hamlet relationships	Positive reactions to the nature of the KMN-KMN-L relationships

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Inputs	Activities	Outputs	KPIs	Expected Outcomes	KPIs
Activity Focus: KMN Content Development and Distribution Platform					
Apply te(a)ch to Platform	Establish initial programming and connectivity plans (e.g. te(a)ch)	Plans with targets and budgets for staging agreements with communities	Plans accepted and implemented	Well-functioning of programming with broad acceptance at youth and community	Number of communities within acceptable success parameters
Leverage te(a)ch Curriculum Train programming directors and technical support	Deploy programming to each participating hamlet	Instructors trained and learning, participation programs launched with full retention of youth participants	#s of youth users retained, good satisfaction score Activities deemed relevant by youth, Elders and community Usage growth and interest results	Programming is well received and effects being effect throughout the community and its youth	Highly satisfactory evaluation of program delivery and personnel competence
	Deploy technical facilities to each participating hamlet	Networks and data centres established, maintained	Schedule and level of detail reporting meets requirements	KMN-L leadership in well-functioning connectivity spurs wider community improvements	# of Makerspaces considered indispensable hubs for community
	Assess/evaluate program and build for sustainability	Program start-up, annual plans for revisions, add-ons Data collection and evaluations undertaken	ED, instructor reviews, youth feedback, community feedback, and KMN-led reviews with main stakeholders	Sustainability plans developed and implementation occurs throughout the program	Impact data indicates success as well as ongoing budget viability
	Develop Elder-Led Curriculum Develop Adult learning curriculum Deploy new programming and updates	New curriculum modules for adult and elder-led Produce updates for all modules according to feedback and regular reviews Distribute to affiliated KMN-Ls	Agreement on operating model, staffing, payment terms and successful roll-out with few outages	Overall combination of programs meeting goals of initiative, at least in the learning materials and their delivery	Community, youth, instructor evaluations of content and delivery effectiveness
	Develop Arctic Internet Exchange program Roll-out IXP and data centre program	Acquisition of equipment, contract with technical services and support local installation with maintenance services		Bandwidth infrastructure considered a great asset for the KMN-L and whole community	User and operational metrics and community satisfaction measures

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	Train, recruit for follow-up years	Training through on-site and online training in the community and centrally	Cost-benefits in terms of quality and retention of trained staff	Upgraded work force throughout Nunavut for this kind of curriculum and technical elements, and Makerspace management	Operational performance of Makerspaces, community satisfaction and youth achievements

Inputs	Activities	Outputs	KPIs	Expected Outcomes	KPIs
Activity Focus: Manage Local Site Operational Start-up					
KMN advice and support	Build management & accountability structures	Functional offices & management structure	Documented policies and organizational responsibilities	Effective leadership and working relationships	Government & community confidence in KMN-L
KMN systems support	Operationalize reporting and financial management systems	Quarterly performance & financial management reports	Timely quality data that is accessible to the designated users	Accountability for results achieved	Project Charter requirements met on a year by year basis
KMN broadband connectivity requirements Staff training	Install, maintain broadband infrastructure	Advanced broadband activated in Makerspace	Timely installation, training and little downtime	Skilled support staff advance community digital literacy	Transferable skills open up new opportunities
Pilot-test new youth programs	Administer pilot tests to new programs	First cohort pilot tested and lessons learned	Reviews conducted and curricula revised as necessary	Responsive programming New elements added systematically	Satisfactory youth exit survey & parent-Elder feedback
Consultations, information material / meetings & public reporting	Manage Community Relationships	Committed and engaged community	# orgs and individuals actively involved	Long term community support	Active board & advocates; ownership for future by community
KMN support for local Privacy systems	Privacy regime established for local data	Effectively protected personal and community information	Adequate data collection, and guarded distribution practices	Trust and support of data collection and its use	Community and individual confidence in privacy protections

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Inputs	Activities	Outputs	KPIs	Expected Outcomes	KPIs
Activity Focus: Deliver Youth Programs and Activities					
Promotion activities, word of mouth	Recruit / enrol target youth	Broad youth participation	Yearly enrolment increase	All target youth are reached & involved	Youth join as a normal part of development so no one left behind
Trained, enthusiastic, committed instructors Mentoring guides and guidelines	Operate programs and activities: • te(a)ch extra curricular learning • Peer circles • Elder mentoring and traditional language / culture revitalization programs and projects • Recreation • Creative arts • Leadership training	Engaging programs and activities Stronger links to traditional culture and language; new 'interest-based' youth mentors Programming reaching at risk youth	Enrolment increases and expanded # of activities and interests Satisfied youth and parents Active program participation	Development of more capable youth	• Assumes leadership • Active, vocal participation *(attendance)* • Acquires new skills and interests • Has a role model or mentor(s) • Establishes new social connections • Takes pride in personal appearance • Exhibits altruistic behaviour • Exhibits new self confidence Δ
Personal Growth Charts as prepared by program leaders, mentors, health professionals	Document progress jointly with each youth	Record of new skills, know-how, coping mechanisms, knowledge, relationships, participation, networks	Measurable new skills, interests, knowledge, know-how, coping mechanisms, relationships	Improved youth awareness, acceptance of self, focus on community, & care for future	See above attributes of successful outcome

Δ *Assessed through (questionnaires, interviews, observation; assessment of Personal Growth Charts)*

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Monitoring, Reporting, and Evaluation

Project Monitoring: This activity will be on-going throughout the 5-year initiative. Monitoring will include data reviews to ensure quality and consistency. It will include client surveys to gather information on the youth experience to make necessary improvements. If early interventions such as additional training are necessary, the monitoring system will pick up such clues through the data collection system. Public meetings are another format that will be utilized on a regular basis that can serve, among other purposes (open communications, stakeholder engagement and consultations), as input to program refinements.

Midterm Progress Assessment (year 3): A more formal external assessment is planned just past the midterm to determine how the initiative launch is shaping up, and to identify issues that need to be addressed in the latter half of the program. Any unidentified risks will be worked back into the project framework. Feedback and more qualitative insights are sought as definitive results will not be evident at this early stage. The purpose is for internal learning and course correction.

The Summative Evaluation is the final, comprehensive impact evaluation which would be carried out by government or by an independent 3rd party at the end of the initiative. As this proposal is confident of on-going sustainability, this evaluation will also be used by Makerspaces to provide guidance to the post-government phase. This evaluation would examine goals and outcomes to determine how well public dollars were spent, whether and to what extent goals and objectives were met and desired outcomes achieved. It is designed to report publicly and for government auditors to address value for money.

Such evaluations are data driven, focusing on the inputs to activities implemented and outputs from them. By definition, this is a medium-term evaluation as longer-term impacts will not likely be visible for several years after the evaluation. Summative evaluations are often used to refine future government interventions and to contribute to the public knowledge and research base for future programming and policy development. The more immediate public to which this initiative is accountable is the local community and this evaluation will be of great interest in the communities and accountability will be rendered there as well about successes and shortcomings. The logic model described in the tables above provides an initial framework for this evaluation, which will be updated according to how the initiative progresses.

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Data requirements and collection: Pre-evaluation is sometimes undertaken to get a clearer baseline picture of the state of affairs. However, as there is already sufficient existing population data on the disadvantages in the North, this initiative will instead focus on pulling together **baseline data** and information profiles of communities that line up, to the extent possible, with planned activity inputs and outputs. For example, the number of youths already engaged in recreation or other community activities such as after school programs; numbers of youth with laptops, hours spent on the internet, etc. This review can form part of an 'environmental assessment' which should be undertaken as part of the start-up activities. Such an assessment will provide an opportunity for everyone to understand the environment, challenges, opportunities and risks to the initiative.

Annual audited statements (see Finance Chapter) can also look at value for money, integrity of financial systems and expenditures, risk management, internal controls and the effectiveness of governance. Business processes can be examined for consistency across communities.

Public reporting is an essential part of good governance. An annual report by KMN will be produced that summarizes progress in all the communities. Clearly these reports will be more qualitative in the earlier years. It might use youth attitude surveys and stories to convey how the initiative is unfolding. However hard data on numbers of youth involved, program activity outputs, community participation, will also be included.

One final initiative that the proponents of this initiative are committed to is the creation of a **longitudinal database** that will allow tracking of youth participants through life over a longer period of time. Such data will be important information for Inuit society where the belief is strong that decisions and activities today should result in a sustainable world for future generations. KMN will seek out separate research funding apart from Makerspaces to help design the project so that data systems can be designed at the outset to track individual progress and store additional data. Patterns and trends over a longer period of time are important to addressing fundamental societal issues associated with death by suicide. Inter-generational trauma can take generations to overcome and it is important that Makerspaces not be treated as a one-off initiative. Governments are also interested in replicability when public funds are invested. The Makerspaces model is also relevant to Indigenous communities elsewhere in Canada where rates are also high.

Evaluation Plan

This evaluation plan applies a participatory framework - a method which prioritizes collaboration between researcher and community members through joint planning, implementation, and presentation of the evaluation plan. This participatory framework is focused on collaboration for the continuous adjustment of the program to better meet its goals, and "to improve research protocols by incorporating the knowledge and expertise of community members"[47]. Throughout our plan will be a focus on process at the same time as results, creating opportunities to integrate feedback, and reflection in responses to lessons learned. This evaluation plan will be governed by the KMN board (which will include local representatives from each Hamlet as well as leaders from territorial organizations), and further

[47] Qaujigiartiit Health Research Centre. *Pathways to Mental Wellness for Indigenous Boys and Men: Movember Project Report.* 2018. Web. 10 Jan. 2019.

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developed and implemented by QHRC in collaboration with each hamlet and local delivery organization. In response to the core values of this initiative, the evaluation plan will be:

- **Community-led**: Embrace self-determination through participatory action research and the KMN governance model
- **Strengths-based approach**: work alongside and in consensus with individuals and communities to identify indicators that measure strengths to promote life and wellness through time.
- **Grounded in Inuit Knowledge**: Important that the approach is Inuit specific, holistic and positive; that it supports language and cultural capacity, where the role of Elders and young people are acknowledge and reflected in the development of indicators[48].
- **Capacity building and sustainability**; Foster autonomy and develop capacity for evaluation in the community.
- **Knowledge-sharing and collaboration**: work in partnerships with community, its members and organizations.

Data Collection and Use

Finalizing the indicators selected and clarifying exactly how they feed into medium term outcomes will require extensive community discussions, given the importance of community ownership of its own data and the story told from that data. Assumptions about data collection need to be recorded as a fundamental part of data partnership arrangements within the project management Charter so that there will no misunderstanding regarding expectations and so that any data/system limitations can be addressed early.

Aggregated data at the territorial level is essential to success of the initiative and for accountability back to the federal government. Privacy considerations will, of course, need to be addressed. Personal data will be subject to strict confidentiality rules [see Data and Privacy Chapter/PPIA].

The timelines established for local data collection need to be firmly part of the Charter partnership arrangements in order to meet quarterly reporting to funders. Funding holdbacks will be used to structure reporting in, if necessary.

Data will be collected on a mandatory basis, aggregated and reported into a central electronic database. Data will then be interpreted to assess if goals and milestones are being met. Collecting both qualitative and population or service data at local delivery points will require simple, easy to manage tools. Care will be taken to keep the data reporting system simple and training will be provided. Local Makerspaces leaders will need software to record and interpret behavioral cues as they occur on site to track youth progress in achieving wellness. Leading edge social measurement tools will be utilized through tablets with pre-loaded frameworks and data collection categories so that low literacy or language translation barriers are not deemed impediments.

Interpreting data will result in performance benchmarks over time to create standards of performance. Comparative data will be available by Year Three. Disaggregating data based

[48] *Alianait Inuit Wellness Framework*. Web. 5 Dec. 2018.

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on a small population will be a challenge and care will need to be taken not to assume trends from this data too early.

Performance management software will have to be purchased to enable data entry, storage of information in a structured way, and to provide output information. Software capabilities needed will likely include survey capability, individual case management, a central data storage hub, and data analysis. Ideally the ability to track relationships with partners and stakeholders would be included. System capacity must be able to include qualitative data (observation, attitude surveys, beliefs, values, fears) and quantitative data (services use, population comparisons with other Canadians) to demonstrate progress and measure change. An example of possible software is Efforts to Outcomes (ETO).

Risks

Risk	Description	Action
Project Management		
1. KMN and/or KMN-Ls fall behind schedule	Outcomes and funding milestones are not met	• Early warning project mgt schedule already in place. • Build flexibility into timeframes for unanticipated events. • Early alerts to funders for possible schedule changes
2. More extensive training is required than planned	Inadequate skills to do the job	• Corners cannot be cut on training. • Selection of staff must focus on ability to achieve learning proficiency required.
3. Different data systems lead to uneven and non-comparable data	Established local organizations may have their own data systems and the challenge will be to collect and collate uneven data from a variety of sources.	• Extra technical support in Year One, including provision of standard, simple templates • Good training essential to data integrity – • Up front investment in getting the KPIs is required • Pilots can help refine KPIs if necessary • Flexibility needed to amend as required
4. Data interpretation – qualitative and quantitative	Danger of interpreting meaning in small numbers; challenge to interpret qualitative data	• Good training toward data interpretation reliability • Avoid over reliance on early data interpretations for a small Nunavut population
5. Data integrity	Data will likely be managed by generalists, many with little or no	• Simply designed coding inputs • On-going support and coaching • Good training and refresher courses

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	knowledge of data collection and systems	
6. Cost of data collection systems	Quality data and information are essential to measuring progress	• Build on existing hamlet data collection and information systems to the extent possible • Less than perfect data and information are often a reality with cost trade-off
7. Hamlets are late submitting data	Flexibility is needed due to unforeseen circumstances, but persistent lateness presents a problem	• Examine overall progress, as lateness in reporting is often symptomatic of problems or inconsistencies in delivery • If persistent, resort to funding holdbacks
Mental Wellness Model		
9. Comprehensiveness of wellness model and complexity of mental health issues	Mental wellness is a complex issue and there may be differing views on appropriate approaches	• Mental health professionals will be asked for input to further identify appropriate protective factors that have been preliminary identified as practical and workable indicators in Makerspaces • Parents and entire communities will be encouraged to be active in supporting youth • KMN model is holistic and integrates many approaches
10. A death by suicide occurs in a community	Confidence in Makerspaces may be damaged	• A death by suicide is devastating for an entire community and the country at large; some children experience extreme adversity earlier in their lives that Makerspaces cannot address. • Staff will be trained with ASIST and trauma-informed practice to provide guidance and first aid to a person at risk in ways that meet their individual safety and privacy needs. When appropriate, mental health experts will be asked to intervene. In no way will Makerspaces staff attempt to provide professional or clinical care. • Parents, teachers, KMN-L leaders, professionals and community members at large need to collaborate on holistic support for each youth – it takes a village • Counseling for parents and youth peers
Community Support		
11. Weak community support	Project stalls due to community misunderstanding or internal resistance	• Inevitable that some individuals may be off-side – important to identify change champions as essential part of change management strategy • Strong local communications and outreach strategies need to be in place to avoid information gaps

12. Engaged parents play a critical role	Parents may be too overstretched to play a strong role; home life may be a mitigating factor	• Parenting sessions and parenting tools will be offered to the community • Professionals can be alerted as necessary • Tools can be developed for parents • Someone on call 24/7 at KMN-L and/or other hotlines
13. Multitasking	Community members are often overstretched with numerous other community responsibilities	• Sufficient resources need to be available to the extent possible to hire staff • Premium to be placed on creating good, full-time jobs
14. Understanding terminology	Language barriers may pose a challenge, as well as a focus on new terminology	• Terminology used will need to be defined clearly in both English and Inuktitut

Chapter 4: Project Management

The purpose of this chapter on Project Management is to show how the initiative would be implemented and managed. It will be organized around several **work streams**, each of which will consist of activities arranged as **tasks** and **subtasks.**

The initiative will, in fact, go well beyond the resources of the Challenge Fund. However, the initiative is triggered by the Fund and thereby accountable to the Challenge Program funders. The Project Management would fulfill the mandate accorded to the Fund's recipient, and as enshrined in a **Project Charter** (or contribution agreement). This Charter would spell out the roles and responsibilities of each party, and the arrangements for releasing the funds according to a milestone schedule. As the instrument to implement the initiative, the Project Management system is situated within the governance framework. The Project Charter is the agreement between the Challenge Fund and the to be constituted Katinnganiq Makerspace Network (KMN). Please see Governance Chapter 2 for the details about the structure and authority of the proposed KMN non-profit organization.

As indicated in the Introduction, the ambition of the initiative is transformative – In that sense the initiative is all about "**change management**". Thus, the Project Management functions are very much oriented toward learning, collaborating, and innovating. An important vehicle in this desire to improve the protective factors of Inuit youth is the utilization of **technology** – improving broadband and its applications and uses to the individual hamlet communities. Accordingly, the Project Management remit includes deploying communications and IT technology - as described later in the Technology Chapter. As a change management process, the Project Management approach must clearly include effective engagement practices to help bring along the targeted communities. This **engagement process** is described in more detail in the Engagement Chapter.

Part of the success of the project will be in the collection and handling of the socio-economic and project data, which is one work steam of Project Management. How the **data generated locally is managed** in terms of maintaining personal and community privacy is discussed in the Data and Privacy Chapter.

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The Project Management is governed by the resources from the Challenge as well as other financial and in-kind services supplied elsewhere. The Financial Chapter outlines the **budget** for the initiative, at least for that part that is covered by the Challenge Fund.

This Chapter outlines the proposed project management system for the 5-year life of the initiative under the aegis of the KMN. This not-for-profit organization is to be set up as the proper authority to receive the Challenge grant and be responsible for the expenditure of the public money transferred to it - see the Governance Chapter. It will extend funds and services to locally organized **Makerspaces,** which are referred to as local KMNs, or KNM-Ls in the up to 25 Inuit communities that represent the potential beneficiaries of this project. As such, a central challenge for the project management's is to manage the process of creating the local Makerspaces in each of the hamlets in which there is a locally committed entity to work with the KMN.

The process of setting up and supporting these Makerspaces will include working with partners to establish free, public peering points (Internet Exchange Points) and **data centres** in communities with a Makerspace program. The project management team would be responsible for working with partner suppliers through agreements, contracts and training to help the communities install and maintain these data centres and Internet exchange points – see the Governance and Technology Chapters.

The project management system consists of a project management office (PMO) for receiving and allocating funds, operating an effective financial control system, milestone-based accountability, and the performance management system (see Performance Management Chapter) to evaluate project performance. Through funding it will receive for the Smart Cities the project management will hire, contract, and grant money for services rendered through standard contracting purposes.

Project Management Approach and Principles

The project management approach is designed to fit within the philosophy of all the institutional elements and values describing the Nunavut Territory and this initiative. It is one of collaboration, consensus building, and learning and sharing. It is also about capacity building. The project management approaches and principles that have been followed right from the start of the application process are the following:

Effective Partnerships and Relationships - A culture grounded in common values and principles is essential to project success. These values need to guide behaviour, support customization of local delivery, and enable empowered local sites, consistent with modern management approaches.

Sound Leadership - Dialogue, good communications, supporting a cooperative culture are all dependent on strong, credible leadership committed to a culture of excellence. Selection of the KMN board Chair, members, ED and securing the best talent locally are key ingredients.

Talent Development - The Nunavut Inuit talent pool is small and talented individuals are often multi-focused. Timely development of local leadership, especially youth, is a key dependency of this project. KMN will undertake talent identification jointly with communities and develop and launch practical training programs focused on essential project skills

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acquisition. Some outside or non-Indigenous talent will be necessary in certain specialized professional areas.

Capacity Development - Shortage of organizational capacity at the local level for management of a makerspace: in this case, the KMN will leverage its resources and work closely with the specific hamlet to support and create capacity within the community. There is also a shortage of teachers/capacity for programs facilitators – which will need "train the trainer" approaches and capacity building programs in terms of curriculum delivery land administrative support.

Self-Sufficiency - While the Nunavut culture of self-sufficiency is strong, extra efforts by both the KMN and local hamlets are essential to securing the future of Makerspaces into the future. Discussions have already been held with supporting stakeholders, and proponents of Makerspaces are optimistic about future funding prospects.

Sustainability – From the beginning it is understood that a major challenge is to ensure the sustainability of the project beyond the lifecycle of the Challenge. This initiative seeks to work with each community to create capacities and implement a sustainable plan for the long-term maintenance of makerspaces, including beyond the life-cycle of this grant.

Transition from Smart Cities Challenge Application

For the past year in the application process, project management has been carried out as a joint venture among the 4 core organizations with the active participation of a range of other Nunavut stakeholders. We have operated under a governing MOU which sets out the authorities and decision-making responsibilities. Pinnguaq has acted as project manager since the shortlist award, while NAM has acted as the financial controller.

Upon notification as a recipient of one of the $10M awards, a transition process will ensue to negotiate the Project Charter and to set up the KMN, as described in the Governance Chapter. The KMN will need at least three Board members (Chair, vice-chair and Treasurer) and one staff (Executive Director) for initial deployment, in order to launch the initiative. In recognizing that individuals wear many hats and the need to support emerging leaders, the collaboration between NAM, PInnguaq, QHRC and Embrace Life Council will act as a transitional board with the workforce capacity to set up the process.

This initial board would elect a chairperson and the board would hire a start-up executive director. As explained in the Governance Chapter, the executive director could be contracted for an interim basis, preferably someone who has been fully involved with the initiative and who has project management skills and experience.

The KMN chair, board and ED will need to set the tone of the initiative at the outset. Makerspaces integrity and securing public trust will depend on sound guardianship of public funds. The Chair will establish a culture of accountability and code of ethics from the outset and ensure that the board has a full sense of the nature of public scrutiny to satisfy donors and board constituents (partners, stakeholders, volunteers).

The KMN board will need to accelerate development of governance tools will both guide and direct key activities across Nunavut, including policies (on essential things like conflict of interest, privacy, accounting requirements, rules of conduct), by-laws, strategic planning requirements/goals with clear goals and milestones to guide the ED's business plan, clear

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reporting structures, a funding strategy to secure Makerspaces long term future, a community consultation framework, a public communications strategy – among other start-up activities.

Project Management Staffing

Since the main purpose of the KMN is to implement the vision of the initiative, the Project Management team and the staffing of KMN are essentially one and the same. Apart from the executive director, the project management team would consist of the following positions – which could be filled through straight hires or contracts, for full or part time, and for short or long durations. Some individuals might be available for part time, or for a short time, and might be more suitable to start-up than managing the program geared to the creation of a network of effective Makerspaces in each hamlet in Nunavut. The likely early full or part-time hires would be the following:

- **Director of Finance & Development** to establish proper control systems and processes as well as manage the cash flow and accountability requirements for the award recipient, the KMN and to develop a fundraising plan;
- **Outreach and Engagement Coordinator** to work with the executive director to develop the relationships with hamlets that will encourage their starting up the Makerspaces in each community;
- **IT Manager** to work in parallel with the executive director and engagement relations director to oversee the deployment of computer and telecoms equipment and connectivity for the Makerspaces start-up and operations, along with training for staff;
- **Content and services development director** to build on the modules of t(e)ach and other curriculum (or extra-curricular) support material along with digital art and other content material to be distributed to Makerspaces;

Again, the above depiction of opening positions is pro forma only. Some responsibilities might be combined or separated; some positions might be filled by the same person; some may be assumed by a firm as opposed to an individual. The structure may change depending on priorities, and availability and skills of the individuals taking those positions. However, the functions that make up each of these positions are key to the success of Project Management.

Work streams and work breakdown structure

This Chapter translates the vision of this proposal into work streams (milestones) with multiple activities in each stream that are called tasks and sub-tasks (deliverables). The main work streams identified below place the work plan into manageable categories for performance measurement and implementation. The table below shows this work breakdown structure in brief, at the work stream and task level. This table is followed by a text that describes the tasks and subtasks in more detail.

Stream	Task

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Stream 1 - KMN Start-up and Engagement	Task 1.1 – Set up physical office
	Task 1.2 – Constitute KMN
	Task 1.3 – Negotiate Charter with Challenge Program
	Task 1.4 – Set up KMN operational systems
	Task 1.5 – Assess community readiness and select
	Task 1.6 – Create Makerspace roll-out plan
	Task 1.7 – Engage and obtain hamlet commitment
Stream 2 - KMN Content and Platform Development	Task 2.1 - Establish initial programming and technical plans
	Task 2.2 – Leverage Te(a)ch Curriculum
	Task 2.3 – Develop Elder-Led Curriculum
	Task 2.4 – Develop Adult learning curriculum
	Task 2.5 – Develop Arctic Internet Exchange program
	Task 2.6 - Roll-out bandwidth and data centre program
Stream 3 - Deliver Youth Programs and Activities	Task 3.1Deploy programming and training to each participating hamlet Task 3.2 - Operate programs and activities
	Task 3.3 - Draft requirements for interconnected web-based platform
	Task 3.4 - Deploy technical facilities to each participating hamlet
	Task 3.5 - Train, recruit for follow-up years
Stream 4 - Manage the KMN-L start-ups	Task 4.1 Support local KMN-L start-ups
	Task 4.2 – Build management & accountability structures
	Task 4.3 - Deliver training
	Task 4.4 – Support program delivery Operationalize reporting and financial management systems
	Task 4.5 - Develop a Data Privacy System
Stream 5.0 – Performance Measurement, Reporting, and Sustainability	Task 5.1 – Develop Performance Evaluation Framework
	Task 5.2 – Conduct annual performance evaluation

Task 5.3 – Report and conduct independent evaluation

Task 5.4 - Develop a plan for continued and multi-year fundraising

Task 5.5 – Raise new funds

Stream 1.0 – KMN Start-up

Task 1.1 – Set up Physical Office: Find office space for KMN or share space with the current pilot Makerspace location in Iqaluit.

- Negotiate lease, connectivity, services
- Deploy data center and IXP switches and routers at the QHRC office in Iqaluit
- Fit out (as necessary) and move in

Task 1.2 – Constitute KMN: The incorporation of the KMN and the recruitment of the board of directors and staff will take priority in the implementation sequence and will provide the platform for the implementation of the rest of the initiative.

- Incorporate KMN as a not-for-profit
- Establish Interim or first stage Board of Directors
- Set up sub-committees/create bylaws
- Set up Advisory Boards

Task 1.3 – Negotiate Charter with Challenge Program: such a document would in effect be the contract between the recipient of the award and the Challenge Program management.

- Establish negotiating roles and schedule for creating the Charter
- Develop key considerations/provisions of the Charter
- Determine constraints and flexibilities from the government side
- Develop milestones and payment schedules
- Gain board approval and sign

Task 1.4 – Set up KMN operational systems: Such policies as internal quality and financial controls will be put in place, e.g., board approval for expenditures over a certain amount; multiple financial sign-offs; purchasing processes and approvals and guardianship of physical assets; transparency through outside auditors; employee timesheets, etc.

- Develop statement of values and ethics and operating principles
- Develop financial controls and processes
- Create human resources policies, requirements, job descriptions and reporting relationships
- Create detailed budget or first quarter, and pro forma budget for first full year
- Establish organizational and decision-making structure

Task 1.5 – Assess Community Readiness and Select - Makerspaces will be deployed according to a readiness and community capacity assessment framework established by the KMN board.

- Assess community resources, availability of physical spaces, human resources and community social profiles
- Identify local delivery partner to take ownership of makerspace

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- Secure agreement (in-principle) with hamlets to proceed with the investment in a Makerspace facility
- Identify communities that will launch Makerspaces in first year

Task 1.6 – Create Makerspace roll-out plan - Develop a detailed roadmap for the rollout of Makerspaces in each community, including steps for engaging communities and obtaining agreements.

- Define the requirements and identify best practices for dialoguing with the communities
- Develop a model agreement ("Project Charter") plan and define KMN's services and investment plan
- Test and modify in association with hamlet councils and other groups

Task 1.7 – Engage and obtain hamlet commitment - KMN will build on its contacts with the hamlets established over the life of this initiative and engage in further consultations. Critical to this engagement is to identify champions at the community level, as well as human resources with sufficient interest, expertise, and motivation to participate in the development and operation of a Makerspace in that community.

- Determine overall Makerspace resource requirements for years one-five and submit resource requirements and final program details to the funder, as required.
- Sign community "Project Charter "agreements staggered over 5 years. The Charter will focus on local ownership for managing delivery.

Stream 2.0 – KMN Content and Platform Development

The existing 75 modules of the te(a)ch k-12 curriculum constitute an important asset for makerspace programming that Pinnguaq Association, in collaboration with its partners, has been developing over the past year. It will become publicly available on March 5th, 2019. This program was supported by ISED's CanCode granting program and will be expanded upon in the Technology Chapter.

Task 2.1 - Establish initial programming and technical plans

- Concurrent with the deployment of Makerspaces will be the development of community data centres running Internet Exchange Points, a neutral routing location where ISP's, content and network services providers, educational and government networks meet ("peer") to interconnect networks.

Task 2.2 – Leverage Te(a)ch Curriculum

- Expand te(a)ch curriculum
- Make expanded curriculum publicly available

Task 2.3 – Develop Elder-Led Curriculum

- Work with Elders to identify preferred knowledge and skills to be worked on
- Work collaboratively with Elders to follow and document processes and create a set of modules around the topic

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Task 2.4 – Develop adult learning curriculum

- Create 40 pieces of adult learning lessons geared towards an introduction to fundamental digital literacy skills and networking

Task 2.5 – Develop Arctic Internet Exchange program

- Contract Nuvujaq, the project's telecoms services partner
- Work with Nuvujaq to leverage its staff and resources to deploy data centres in KMN-Ls as they sign up with KMN
- Work with community to onboard willing peers to the IXP
- Identify suitable location, collaborating with community makerspaces whenever possible
- Create agreement with data centre or land owner (Arctic IX)

Task 2.6 - Roll-out bandwidth and data centre program

- Ship and install data centre (if required)
- Install IXP equipment (1 switch and 2 route servers, pre-configured before shipping)
- Enable peering networks to connect fibre, wireless or satellite to building and/or setup servers and networking equipment within data center

Stream 3.0 – Deliver Youth Programs and Activities

Task 3.1- Deploy programming and training to each participating hamlet

- Recruit/enroll target youth
- Document progress jointly with each youth

Task 3.2 - Operate programs and activities

- Te(a)ch extra-curricular learning, peer circles, elder mentoring and traditional language/culture revitalization programs and projects, recreation, creative arts, leadership training
- Administer pilot tests to new programs
- Deploy new programming and updates

Task 3.3 - Draft requirements for interconnected web-based platform

- Develop user forum
- Coordinate network storage strategy and group software bundles
- Develop local source control repository (i.e. Git)

Task 3.4 - Deploy technical facilities to each participating hamlet

- Install Internet Exchange
- Install, maintain broadband infrastructure

Task 3.5 - Train, recruit for follow-up years

Stream 4.0 - Manage the KMN-L start-ups

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This stream will be undertaken in adherence to values and principles of modern management - enabling, empowering service deliverers, a shift away from rules-based management. It is also necessary when working in different contexts/locations where a one size fits all rule may not be applicable and local solutions are encouraged.

Task 4.1 Support local KMN-L start-ups

- Recruit and onboard local executive director with appropriate training
- Procure physical space for the community Makerspaces
- Recruit and train (staff should be dedicated full-time and local to the extent possible); technical, managerial and facilitation training will be provided for staff
- Recruit and train local staff for operating the Makerspace, including broadband connectivity and links to the local data centres
- Build, retrofit, furnish, and connect the physical facilities

Task 4.2 – Build management & accountability structures

- Develop bookkeeping systems, uniform financial reporting, job descriptions, results measures, purchasing, codes of care in dealing with youth (police clearances, handling situations, etc.), technology use and training/certification requirements.
- Convert to the Manual which would include templates, processes, incorporation material (including registration and bylaws), leasing agreements (space and equipment) and pro forma budgets and for the local KMNs.

Task 4.3 - Deliver training

- Develop modules for the KMN-L staff and local board
- Administer technical, managerial and facilitation training (ongoing)

Task 4.4 – Support program delivery

- Deliver Laptops through the CFS program (where the Pinnguaq Association works to make computers available to any Nunavummiut or Nunavut based organizations that require them through the Computers for Success Nunavut Program, funded by Computers for Success Canada and ISED.)
- Support local delivery organization in managing the programming of its own space, with access to the te(a)ch curriculum through an e-learning content management system at first, and later integrated into the KMN Network.

Task 4.5 - Develop a Data Privacy System

- Consult with KMN-L and hamlet community
- Design and review with the Privacy Commissioner of Nunavut
- Implement in first year

Stream 5.0 - Performance Measurement, Reporting, and Sustainability

Performance measurement is also key to maintaining public trust. Outcomes measurement through meaningful data is essential to demonstrate that organizational mission and goals are being achieved. Metrics, both quantitative and qualitative, will be established for

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each activity. Affordable financial systems that can deliver performance data for to guide the ED's business plan and outputs, as well as qualitative social indicators. Sustainability involves making the program attractive to an increasing number of stakeholders and obtaining sufficient revenue sources to sustain the program beyond the 5-year Challenge funding period.

Task 5.1 – Set Performance Evaluation Framework

- Modify identified metrics in collaboration with each community
- Develop evaluation materials

Task 5.2 – Undertake Annual Performance Evaluation

- Collect data for identified metrics
- Year 2 onwards, compare collected data with baseline data collected in previous years
- Incorporate feedback into service delivery and opportunities for course correction

Task 5.3 – Reporting and Independent Evaluation

- Annual public reporting is the tool for conveying this information to funders and constituents. Both written reports and community public meetings will provide the necessary transparency.
- Evaluation is a key aspect of demonstrating performance. Periodic independent evaluation will be undertaken in accordance with funder requirements.

Task 5.4 - Develop a plan for continued and multi-year fundraising

- Prepare different budget levels depending on the rate of roll-out to communities
- Assess impact of new funding sources on the realization of the plan
- Identify sources of funding for different aspects of local makerspaces

Task 5.5 – Raise new funds

- Identify new stakeholder targets for supporting the KMN infrastructure and programs
- Develop campaigns for additional support

Execute campaigns with supporting stakeholders – governments, private/public companies

Identifying and managing risks through risk mitigation strategies

Risk	Description	Mitigation Action
Project Management		
1. KMN and/or KMN-Ls fall behind schedule	Outcomes and funding milestones are not met	• Early warning project mgt schedule already in place. • Build flexibility into timeframes for unanticipated events. • Early alerts to funders for possible schedule changes
2. KMN and/or KMN-Ls fall behind schedule	Outcomes and funding milestones are not met	• Early warning project mgt schedule already in place. • Build flexibility into timeframes for unanticipated events.

		• Early alerts to funders for possible schedule changes
3. Issues arise because of programming has critics, does not fit the community	Some communities may experience problems with the content of the curriculum or its delivery to youth, or cause concern in the community	• Early course material is tried and tested • Exec directors/instructors at KMN-Ls are well trained and encouraged to report issues for resolution • Good community rapport is super-emphasized in the project to avoid communications breakdowns • Courseware will be tested before going into full use • Board members with expertise in wellness services will ensure access to proper wellness guidance
4. Complementary funding falls short, or is late – or is misused	Besides the Challenge program funding, this initiative depends on a variety of other funding sources – and shortfalls could occur; Misuse is always possible at the KMN or KMN-L levels	• Invest in strong control and fundraising skills in key KMN staff, who will take prudent measures to ensure program stability. • Treat fund raising as a continuous activity from the launch of the project • Control function will establish procedures for monitoring, tracking transaction in real time, such as multiple sign-offs on checks, at least 2 level review of bank statements, external audit, etc.
5. Persistent breakdowns of the technical infrastructure	Location of Makerspace, equipment failure, inadequate maintenance, or other causes of interactivity breakdowns	• Work with tried and tested service operators • Train, train, and train the Makerspace team, rather than rely on one maintenance person in the community • Establish an online support service to help a community to troubleshoot.
6. Staff turnover disrupts operations at KMN or KMN-L	Retention in stressful occupations is doubly difficult in the North	• Build redundancy in the overall KMN community, and bring in trainees/interns as a natural outgrowth of a sought-after employment • Bring local communities into the KMN-L family to provide other reasons to stay, grow with Makerspace
7. Youth issues prove to be intractable in some communities, thus jeopardizing Makerspace program	Because there are many pressures on youth in Inuit communities, Makerspaces and its programming may not be able to cope	• KMN's emphasis on community involvement in Makerspaces should reduce exposure to this risk • KMN will have enlisted support from a variety of stakeholders, e.g. social and medical services, hamlet officials, and other service organizations – so

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		wholistic approach should help mitigate risk

Risk management requires advance preparations for unexpected events that are sure to arise. A two-part strategy will be utilized – prevention and mitigation. [Training and awareness are the best tools for prevention. And effective management practices that ward off any form of corruption, such as multiple sign-offs on checks, at least 2 level review of bank statements, external audit, etc.

Working with youth has unique security requirements as well as youth worker training to work with at-risk youth. Makerspace leaders will need to be knowledgeable of youth services available for referral in the community, including mental health, substance abuse, housing, vocational training, parenting requirements, etc.

Project schedule, deliverables and payment schedule

Because of the simultaneous, circular and collaborative character of this initiative, with several ongoing activities at any given time - we believe that an outcomes-based contribution payment schedule could be provided in four equal amounts, once per quarter, to account for the different ongoing (annual) outcomes, according to the budget submitted.

	Year 1	Year 2	Year 3	Year 4	Year 5
April		$ 532,750.00	$ 538,800.00	$ 526,850.00	$ 537,150.00
June	$ 364,450.00				
August		$ 532,750.00	$ 538,800.00	$ 526,850.00	$ 537,150.00
September	$ 364,450.00				
December	$ 364,450.00	$ 532,750.00	$ 538,800.00	$ 526,850.00	$ 537,150.00
March	$ 364,450.00	$ 532,750.00	$ 538,800.00	$ 526,850.00	$ 537,150.00
Sub -Total	$ 1,457,800.00	$ 2,131,000.00	$2,155,200.00	$2,107,400.00	$2,148,600.00
Total	$ 10,000,000.00				

Below is the Gantt Chart for the project tasks (milestones) according to a schedule for the next 5 years, with the first year being the most detailed one.

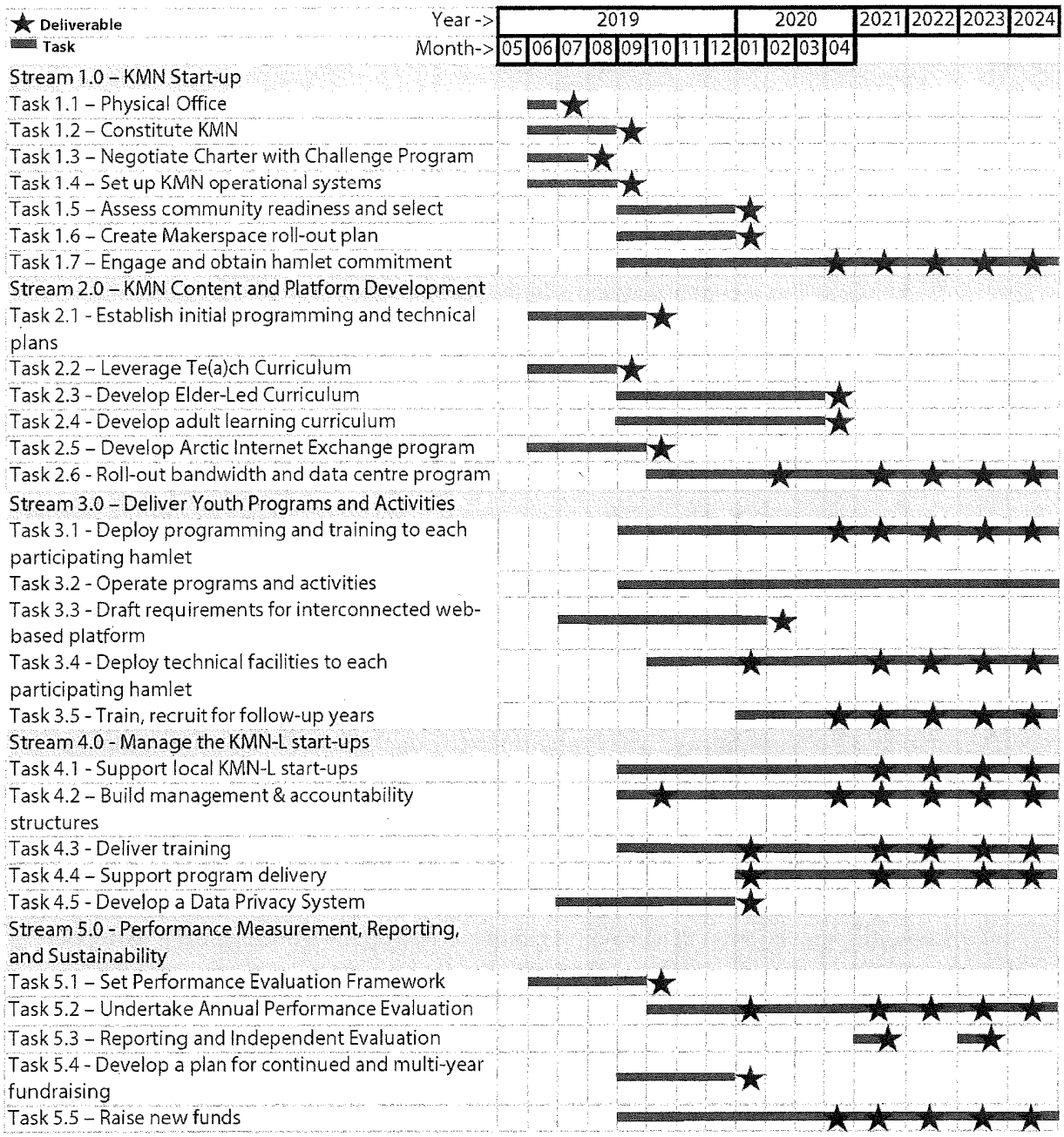


Figure 4: *This figure is Gantt chart outlining the project schedule and deliverables*

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Chapter 5: Technologies

Currently, internet in Nunavut is connected by satellite, and internet connections are offered to all Nunavut communities by the internet service provider SSi Micro[49]- with connection speeds of 5Mbps delivered by Telesat's C-Band Satellite. However, the connectivity landscape is quickly changing. In July of 2018, Telesat launched Telstar 19 VANTAGE, a new generation Ka-band satellite that combines broad regional beams and powerful high throughput satellite (HTS) spot beams[50], which will service the North with connection speeds of 15Mbs. Northwestel has recently received $49.9 Million in funding from the Canadian Government's Innovation, Sciences, and Economic Development (ISED) department to build 25 new satellite earth stations to deliver this 15Mbps high-speed broadband data to every single Nunavut community by the end of 2019[51]. At the same time, Telesat will deploy a constellation of low-earth-orbit (LEO) satellites (~1,000 km from earth; ~35 times closer than traditional satellites) that will be able to provide fiber-like quality throughput anywhere on earth by 2022[52]

.

Amongst these rapid changes, The KMN will be a source of ongoing support to ensure that Inuit communities gain from these rapid technological advances, benefitting the future of Inuit youth. The technologies presented here will seek to open up local communication portals for both youth and communities to connect; build capacity in children, youth, and adults to gain technical and problem-solving skills; provide opportunities for individuals to gain access to local, relevant, and Inuit-specific content and educational materials, and to provide tools and devices to support the interests and strengths of individuals through central community hubs (makerspaces). The breakdown of activities include the deployment of internet exchange points, the creation of a digital Makerspace network platform, and the deployment and further development of learning and capacity building resources and tools.

The Arctic Internet Exchange

As mentioned, internet in Nunavut is connected by satellite through each network (Northwestel, GN, Qiniq, Ice Wireless, SSi Micro), but those networks do not interconnect, meaning that connecting to a site to and from different networks requires two satellite hops, making connections expensive and slow.

An Internet exchange is an organization responsible for running Internet Exchange Points (IXPs), a neutral routing location where ISPs, content and network service providers, educational and government networks meet ("peer") to interconnect networks. An IXP

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[49] *Other ISP's like Ice Wireless, Northwestel offer internet services only in select communities, but that will soon change.*

[50] "Telstar 19 VANTAGE Successfully Launched by a SpaceX Falcon 9 rocket from Cape Canveral on July 22, 2018." *Telesat*. N.p., n.d. Web. 26 Feb. 2019. <https://www.telesat.com/our-fleet/Telstar-19-VANTAGE>

[51] *Canadian Radio-television and Telecommunications (CRTC) targets for urban centres as well as in rural and remote areas of Canada is of 50 Mbps download and 10 mbps upload for broadband Internet access services on fixed and mobile wireless networks.*

[52] "Why LEO?" *Telesat*. N.p., n.d. Web. 26 Feb. 2019. <https://www.telesat.com/services/leo/why-leo>

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establishes a trustworthy location for networks to meet. It keeps local Internet traffic from leaving the community, enables greater security and network services, and often lowers transit costs.

The technology is very simple, the Internet Exchange manages traffic exchanged at an IXP over a shared Layer 2 "switch" which networks connect to and communicate using the Border Gateway Protocol (BGP). Becoming a member of an IXP requires an Autonomous System Number and a network connection from a router to an IXP switchport.

By having networks peer at local IXPs, Internet traffic routes efficiently, avoiding unnecessary long trips. This is especially relevant in remote locations like Nunavut, where Internet is slow, more expensive and often suffers huge latency and congestion over satellite. If networks in Nunavut start interconnecting, a significant portion of traffic that otherwise would have travelled over satellite (and back again) will route directly from one local network to another through the IXP. This will lower the costs to ISPs by decreasing the required satellite traffic (the largest expense for providing service in Nunavut). Not only will local users on different networks have fast connectivity when communicating to each other, but it establishes a community wide platform for high bandwidth applications, content and network services (cloud computing, storage, etc).

Currently in Canada, IXP's exist in Calgary, Edmonton, Halifax, Manitoba, Moncton, Montreal, Ottawa-Gatineau, Saint John, Saskatoon, Saint John and Vancouver. The Arctic Internet Exchange (Arctic IX) has been formed by Nuvujaq Inc and Nunageek Solutions Inc, and is sponsored by the Canadian Internet Registration Authority (CIRA) and the Internet Society. Its intention is to bring Internet service providers, government and educational institutions in the North to connect directly to each other to avoid a waste of resources, while enabling a regional and territorial wide platform for high bandwidth, low latency websites and applications within communities.

The Arctic IX has supported the Katinnganiq Smart Cities Challenge proposal in a collaboration that will see an initial installation of internet exchange points in Nuvujaq's 2 data centres (or in space rented at existing Northwetel/SSi Micro data centres) in five community Makerspaces - thus providing a repository and access point for local content, serving as a learning tool for youth in each community, and improving broadband internet service. Further deployments will be explored and supported where possible, with a hopeful deployment of 25 IXPs' throughout Nunavut communities.

Risks

Understanding and operating an Internet Exchange Point is fairly straightforward, but highly technical. One of the biggest challenges in operating IXPs throughout Nunavut will be overcoming the lack of technical expertise in the community. In order to effectively operate exchanges throughout Nunavut, we will have to provide a tiered support system that includes extensive documentation, technical support and training. This will be addressed through the IXP Network (http://ixp.network/), which promotes research and education of Internet Exchanges and IXP's, and includes building a training and support network that plugs into experts in Iqaluit and the south. Along with Nuvujaq and Nunageek, volunteers from southern exchanges (Calgary, Saskatoon and Toronto) will provide high level technology support and training to local Makerspace staff that are operating a data centre/IXP.

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At the same time one of the primary design goals of Nuvujaq data centres is operational simplicity, with the ultimate goal of functioning with no local technical expertise. We will use a capacity sharing model that relies on one KMN IT position to train makerspace staff to run and maintain the data centres (if applicable) and operate the IXP's.

It is important to note that until GN and Northwestel/Bell decide to peer, an IXP will have little impact, so the primary goal for Arctic IX and the KMN is to work collaboratively with internet service providers to peer locally.

The te(a)ch curriculum

As previously described, the te(a)ch curriculum is a free K-12 computer science program designed for Northern and Arctic communities in Canada with digital content and materials that are culturally responsive to Inuit, First Nation, and Métis ways of knowing. The te(a)ch curriculum meshes a core learning focus of computer science fundamentals with game design, animation, and physical activity grounded in cultural exploration. It is a program with benefits that extend well beyond simply teaching "how a computer thinks". The goal is to implement equitable practices in digital literacy initiatives and harness the strength of Indigenous knowledge and ways of being to build agency and ownership in the use of technology as a creative tool in informed, safe, and positive ways.

The te(a)ch curriculum developed so far comprises 75 lessons or modules designed to support both teachers and students. It has been, and continues to be delivered both through one-week workshops in communities throughout Nunavut and Mushkegowuk Aski, as well as through a custom-made e-learning content management system (CMS). Pinnguaq Association has been developing this curriculum over the past 16 months for the purposes of increasing digital literacy and computer programming skills in the North, with modules soon to be available both in Inuktitut and in English. The first 40 modules will be launched online by March 6th, 2019 at https://pinnguaqlearning.space/. The curriculum lends itself well to be scalable and transferable to other Indigenous, rural, and remote communities across the region, with current adaptations being developed with Curve Lake First Nation. The curriculum is built on the 'Train the Trainer' model, which enables participants to pass on the skills learned in the programs to other community members, and to be a significant resource for teacher training and professional development. The subjects it covers so far include game design, computer fundamentals, online safety, minecraft, art design, digital storytelling, sound design, app development, VR/AR. For a full list and outline of modules, please refer to **Appendix B**.

At the same time Pinnguaq is working to develop and feature intergenerational programming based on Elder-led curriculum geared toward youth that address specific cultural practices, for example, carving, storytelling, printmaking, sewing, and tool-making, to mention of a few - through both physical and digital mediums. The need for this curriculum was re-asserted at the Annual General meeting of the Nunavut Association of Municipalities, which included the mayors of each community in Nunavut. This curriculum will provide an opportunity for Youth and Elders to learn from each others' strengths, build connections and intergenerational support for learning, while expressing cultural identity, documenting traditional practices, and building technologies and resources that support a particular craft and skill. These workshops will introduce the use of new digital skills that preserve and animate

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Inuit cultural heritage and create cultural continuity in a digital environment, while at the same time creating capacity for youth to gain a set of employable and transferable skills.

Additionally, the Pinnguaq Association will be working throughout the next year on adding 40 modules or lessons that will be developed under the principles of adult learning to support digital literacy for community members beyond the k-12 age range. These will address foundations of computing such as *The Absolute Basics*, *Introduction To Coding*, *The Efficient Workplace*, *Web Safety*, *Web Development*, *Online Banking* and *E-Commerce*, *Search Engines, Wikis and Research*, and *Social Media and VoIP Applications,* among others. We also anticipate that as Makerspaces gather momentum and take shape in Nunavut there will likely be a demand for specific learning resources and curriculum to be developed, such as computer networking with an emphasis on BGP/IXP and network maintenance for the KMN Digital Platform. The KMN will work with Pinnguaq Association, along with other partners like Nuvujaq, Nunageek (Arctic IX), and Canada Learning Code to create the appropriate resources and deliver training programs.

Digital tools

Each makerspace will be set up with the necessary tools and equipment to support the programming priorities defined by each community. This will likely include a mix of technologies, including a tiered system of computers (laptops, high end desktops, VR machines), printers, cutters, tablets, cameras, speakers and A/V equipment, robotics, sewing machines, art supplies, electronics, hand tools, carving tools, printing press, etc. While a standard will be developed to support the te(a)ch curriculum, each community will have the flexibility to decide what tools and equipment will be needed, and that is appropriate for their space.

The KMN Digital Platform

The Katinnganiq Makerspace Network (KMN) digital platform has as its purpose to support social connections and collaborations digitally - as well as to enable access to tools and resources for building local capacities among teachers, youth, adults in technical functions. In every makerspace that will feature a computer lab; a digital platform will be setup in conjunction with network architecture that will allow administrators the ability to create individual accounts through a network authentication protocol like Kerberos. Through a Single-Sign-On authentication, community members may gain access to the network platform on any machine, featuring: 1) user forum, 2) network attached storage (NAS), 3) a local source control repository (i.e. Git), and 4) software tools and learning resources.

A user may request a network account by visiting a makerspace and completing a brief orientation. The orientation includes an explanation of the Online Code of Conduct (expanded on in the Data and Privacy chapter) to the user which they must agree to at that time, and an on-site tutorial on how to use the network safely and responsibly. User membership provides access to the resources on the network which are mirrored across all communities, and it also supplies users with storage where they can explore and manage their content. The KMN digital platform includes:

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1. User Forum:

The user forum will enable Makerspace users in different communities to connect with each other to discuss ideas, works in progress, ask questions, propose answers, and learn from each other. The form will be a custom solution based on a tailored LAMP stack application. The site will leverage caching and local storage to accommodate in areas where connectivity can be sporadic. In addition we will be tying users to their unique makerspace account ids to allow for seamless authentication to the forum.

2. Local Lab NAS (Network Attached Storage):

Each space will have a NAS (Network Attached Storage) solution. A NAS system is a storage device connected to a network that allows storage retrieval of data from a centralized location for authorized network users. NAS solutions are low-cost, scalable, and flexible This hardware will maintain a RAID[53] type configuration such as Synology Hybrid Raid (SHR) which will maintain data integrity for the local lab and also be responsible for synchronizing individual user data on individual machines with the master copy in the lab - as well as containing the latest version of a software bundle. If the internet connection is down, user data will still exist in a central location (not on an individual machine) and the NAS will later be able to synchronize data updates with a cloud solution such as google drive when the internet becomes available. This will ensure that it will be feasible to store all user related data in a way where it can synchronize with the NAS and users are free to use any machine and still maintain access to their data

3. A Local Source Control Repository:

The digital platform will host a Git server, which could host multiple repositories for the projects of the program as a whole; providing more reliable, local git access for advanced coders who take advantage of the Makerspace and encouraging collaboration between users. A source control like Git is a fundamental coding skill which is important to teach early to enable students to collaborate on projects, and work on the same code. Some of the options we have been considering are Gogs (100% open source and free of charge; all source code is available under the MIT license on GitHub), and GitLab Community Edition (an open source end-to-end software development platform with built-in version control, issue tracking, code review, CI/CD, and more).

The decentralized nature of Git will facilitate collaboration between Indigenous coders and developers across Makerspace sites, eliminating the requirement of a centralized server and adapting to the uniqueness of rural and remote regions where constant internet access is not always guaranteed. With Git, there is no single point of failure; Data redundancy is intrinsic to the Git decentralized model.

4. Software Bundles and Learning Resources:

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[53] *RAID (Redundant Array of Independent Disks) is a storage technology that combines multiple disk drive components into a logical unit.*

The network will host quick and easy download bundles for all relevant open source software used in the te(a)ch curriculum (the lessons themselves are built entirely around open source solutions). A master bundle containing all the software to be deployed on each machine will be updated and maintained on a regular basis by the IT Manager of the Katinnganiq Makerspace Network. The software bundle will be intelligent enough to do simple version checks and only update software as necessary when a new version is required, or install new software as it gets added.

Deployment to Master from Cloud: This bundle will live on the cloud. Each space will have one "Master" machine which will be responsible for being in sync with the latest version of the software bundle. We will use a "Team" cloud drive which can be mapped and synchronized with the master lab computer in each space. This would normally be done via an internet connection, however it will also be possible to connect an external harddrive to a NAS (Network Attached Storage) to perform a manual update when necessary.

Deployment to Lab machines from Master: The Master computer in each space will be responsible for deploying the updated bundle to each clone machine. Each machine will essentially be a mirror of the software that lives on the master computer. Whenever there is corruption, an administrator simply needs to re-clone the master machine software onto a new harddrive to install on one of the clone machines.

We can also leverage google drive or similar cloud solutions to synchronize individual user data. Every user will have an account which is connected to cloud storage, and therefore any individuals work, code, saved application settings and customizations will be stored in the cloud and portable to any machine in the lab or at any other space.

For example, open source software available on the network to complement educational resources will include but not be limited to:

- Scratch 3: The latest in the world's most popular 'introduction to programming' software.
- Python: Advance programming for users ready to move beyond Scratch.
- TWINE: Open Source narrative storytelling engine.
- Lua/Love: More advanced but accessible programming engine for advanced programming.
- GraphicsGale: An open source pixel art program that is the subject of at least 5+ te(a)ch lessons
- GIMP: An open source competitor to the Photoshop series.
- Voxel Busters: An open source voxel art program for the creation of voxel based 3D models.
- Blender: An open source 3D modeling program used throughout the te(a)ch curriculum.
- LibreOffice: The latest version of the open source project to compete with the Microsoft Office Suite
- Inkscape 0.92.4: An open source professional vector graphics editor for Windows, Mac OS X and Linux.

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Additionally, we will approach existing major companies to provide educational and/or offline versions of their software to the KMN digital platform, which will be complement with curriculum and workshops. These include **Google Suites, Unity, Unreal Engine, Gamemaker,** and others. The KMN digital platform will be built on a number of core principles:

- Replicability: The open source code for this network will be transferable to any new or existing community makerspace that wants to connect (depending on connectivity at each site, this can be done online or through the physical transport of content via airmail on a USB stick), at the same time that it can be used by other rural communities in Canada to create their own network
- Sustainability: With the development of curriculum on networking and network maintenance, alongside the te(a)ch curriculum – local capacities and transitioning plans will be built to monitor and maintain the network
- Offline Accessibility: Given the challenges of regular and consistent Nunavut connectivity, the network will be built to function both online and offline - with updates scheduled when internet is available.

Risks

The biggest risk to these projects are: the availability of internet access at a given time, human capacity to maintain and run these networks, and privacy issues as it relates to open source and connected community networks.

Limited internet access for users: We are addressing this mainly by making the makerspaces public places where technology tools, software, and internet connectivity can be accessed for free – with the support to learn how to use them in creative ways.

Unreliable networks: Connectivity in the Nunavut is unreliable at the best of times. As such, we are building tools that that work as well offline as they do online and that can connect and exchange information at times that don't tax the network. At the same time, we will contribute to improving broadband connectivity by working with the Internet IX to install local data centre and IXP's to improve latency and local traffic

Sustainability and Human Capacity: As addressed throughout the proposal, our focus will be on building technology/infrastructure not just as as end products but as constant learning tools.

Privacy Issues: This initiative will be develop the parameters of data sovereignty within an open source context by developing a strong privacy and data management plan.

Partnerships

The core technology partners in the development and maintenance of the Katinnganiq proposal will build the Katinnganiq Network, networking curriculum, as well set up the Internet Exchange Points and the Nunavut Research Network (with the support of Nunavut Arctic College as a requirement). The core team technology partners include partnerships with both the private and public sector to support the projects as a whole. These are:

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- **The Pinnguaq Association:** As a not for profit technology startup and the lead developers of the te(a)ch curriculum,, Pinnguaq will bring its six years of experience delivering technology education in Nunavut to bear in this project.
- **Nuvujaq** is a Nunavut based not-for-profit society incorporated to advocate for improved connectivity in Indigenous, Northern, rural and remote regions and communities.

Chapter 6: Data and Privacy

This chapter addresses the need to develop processes, protocols, standards and agreements that prioritize privacy, safety, sovereignty and Inuit knowledge in data management and sharing design.

While our proposal embraces knowledge sharing, collaboration and open source technologies as processes grounded in Inuit values, our approach to data and privacy also acknowledges the detrimental impact that the prevalence of a colonial approach to research has had on Inuit, "as the most studied Indigenous peoples on earth [...] subjected to egregious abuses by researchers"[54]. This approach has placed Inuit's own role in research as marginal, while the beneficiaries of the research in terms of access to funding, data, research outcomes and career advancement lay with the researchers themselves. As a result, the notion of "open data in the context of indigenous peoples is a double-edged sword. On the one hand, open data could be used to inform development, allocate resources and set a future vision—and to influence wider public opinion and debates. On the other hand, opening up data may be accompanied by concern about protecting indigenous cultural information, rights and intellectual property"[55].

This proposal's approach to research, data and privacy embraces the notion of Inuit data sovereignty, which aims to situate Inuit self-determination at its core by focusing on priorities that are established by, and serve the needs of Inuit in terms of the governance and management of data (including intellectual property) as well as the use of data to support governance and informed decision-making. This proposal, and this chapter focuses on developing data sovereignty networks and parameters to ensure that the creation, collection, analysis and ownership of data is led and owned by the communities themselves.

As it concerns the interrelationships between technology and capacity building - our proposal recognizes that the ability to develop technology and innovation research that reflect Inuit self-determination and data sovereignty is largely contingent on the access of Inuit to digital literacy and capacity building, tools, educational resources and peer and research networks, as well as funding. With a focus on training, capacity-building and ongoing support for both Makerspace staff and users, the KMN will play a pivotal role in supporting individuals in data collection, use and analysis, as well as community ownership, control, access, of the data generated through the different stages of this initiative.

The existing laws governing privacy or personal information and data that are to be considered in this scenario are the Personal Information Protection and Electronic Documents

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[54] *National Inuit Strategy on Research*. Inuit Taipiriit Kanatami: 2018. Page 5 and 23. Web. 25 Jan. 2019. <https://www.itk.ca/national-strategy-on-research/>

[55] Smith, Diane E. *Governing Data and Data for Governance: The Everyday Practice of Indigenous Sovereignty*. Australia: ANU Press, The Australian National University, 2016. Page 132. Web. 10 Dec. 2018.

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Act (*PIPEDA*), and the *Access to Information and Protection of Privacy* (ATIPP) act. PIPEDA is the federal privacy law for private-sector organizations. Though the KMN will be incorporated as a not-for-profit, we will adhere to its principles. On the other hand, the Nunavut ATIPP governs public and governmental bodies and provides the framework for the right to access public records, as well as to protect the privacy of individuals whose personal information is collected, used and disclosed by public bodies. The KMN and its relationship with municipalities and hamlets, along with funding from public bodies provides sufficient context for regulation under ATIPP.

Our data management plan outlined below is aligned with the ten principles outlined by PIPEDA for the protection of personal information by adhering to and promoting the following principles: 1) Accountability, 2) Identifying purposes, 3) Consent, 4) Limiting collection, 5) Limiting use, disclosure, and retention, 6) Accuracy, 7) Safeguards, 8) Openness, 9) Individual access, and 10) Challenging compliance[56]. Our data management plan outlined below is also aligned with Nunavut's Access to Information and Protection of Privacy Act's (ATIPP), as outlined in the chart below.

Data Ecosystem

The KMN staff and board will provide the governance structure and capacity to work with each hamlet/municipality on collecting and analyzing the data and KPI's necessary to effectively manage the design, development, implementation, maintenance, improvement, and evaluation of this initiative.

In terms of the data life cycle, we will comply both with PIPEDA and ATIPP as described in the following outline. At the same time, we acknowledge that some aspects of this outline will require more detailed solutions as community-led projects are developed - and we look forward to working with the Privacy Commissioner of Nunavut to flesh them out as we move forward.

The data ecosystem in this proposal is broad, and is organized below to provide more clarity on what data elements will be collected.

Data Life Cycle	**Makerspace Data** (registration and attendance)	**Digital Platform Data** (User forum, Local storage NAS, Git, e-learning resources and participants work)	**Consultation & Evaluation Data** (KPI's)	**Authority**
Elements	Name, contact information (or that of parent/guardian), age, community/location, sex, ethnicity, food allergy information	E-mail address, username, user-generated data (messages, photos, code, art projects)	Quantitative and qualitative (opinions + thoughts) data relating to KPI's as outlined in Chapter 3: Performance Measurement. Data will	

[56] *Privacy Toolkit for Businesses*. Office of the Privacy Commissioner of Canada. Web. 8 Feb. 2019. <https://www.priv.gc.ca/media/2038/guide_org_e.pdf>

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			be collected anonymously through simple and easy to read and manage tools (accounting for varying literacy levels and staff capacity)	
Collection	Seek written, valid, and informed consent from each individual for the collection of personal information and data. Outline who is collecting the data and for what purpose. At any point in time, an individual has the right to revoke their consent for the use of their personal information, along with the right to correction.			ATIPP - Part 2, Articles 40 and 41. ATIPP - Part 2: Articles 45
Use and Analysis	Data will be used to design programs catered to age group of attendees, as well as to protect individuals from possible contamination and risk to known allergens at each local makerspace.	Data will be used locally at Makerspace, according to individual desires (such as for feedback, collaborations or problem-solving) and sharing preferences. Interface design will enable users to delete their own content.	Evaluation data will be used and analyzed locally by staff working closely with central KMN partner for performance measurement. The data will be used to inform decision-making and improve programs.	ATIPP - Part 2, Article 43, 44
Storage	Physical (forms) and digital (spreadsheets) files stored at each Makerspace. File formats will conform to open standards and software whenever possible	Individual user data will be synchronized and stored both locally on an encrypted Network Attached storage device and on the cloud using a service such as Google Drive with data encryption.	Data will be stored and centralized within a central electronic database particular software (for example Efforts to Outcomes)	ATIPP - Part 2, Article 44
Trans-mission	Data will only be accessed by authorized staff at the Makerspace.	All data transfers will feature end-to-end encryption using software such as Synology Cloud Sync	Data will only be accessed by authorized staff, in password protected computers. Data will be encrypted in software like..	ATIPP - Part 2, Article 42

Sharing (disclosure) & distribution	Makerspace registration data will not be shared with any third-parties, and remain for the sole use of Makerspace staff to deliver programs.	Each individual will own their own data in the Network and share with others at will.	Data will be shared privately through accountability reports to funders, as well as internally with the KMN board and each Hamlet council. It will also be publically through published reports.	ATIPP - Part 2, Article 47, 48, 49
Re-Use and derivative production	Derivative production will be determined by individual users or communities as the owners of their own data. If the KMN will take on any derivative production or re-use of data (for example to improve services and performance with the creation of new tools, services, or products), it will do so with valid and informed consent, and through the principles of consensus with affected communities.			ATIPP - Part 2, Article 43, 44, 47, 48, 49
Archiving and Preservation	The data and personal informational elements will be kept on file for at least 12 months, and will adhere to the right to be forgotten.	The long term archiving and preservation of data utilized throughout this project will be collected in digital and physical exhibitions, integrated into curriculum, form part of working projects and used in evaluation and published (and/or peer-reviewed) papers or reports. Data will be archived in the user forum under each person's account indefinitely or until the user deletes it or requests it to be deleted.		ATIPP - Part 2, Article 44
Disposal	We will adhere to the right to be forgotten by erasing personal data and information on file as requested by individuals.			Right to be forgotten
Security	Files kept secure in administrative files on secure computer. Makerspaces will be locked after-hours and equipped with alarm where possible.	Single-Sign-on authentication (Kerberos) and NAS synchronization with encrypted software (Synology)		ATIPP - Part 2, Article 42
Access	Each individual and community will maintain their right to access a copy of the data to see how it is being used, and as preliminary step to the exercise of further rights like rectification and erasure.			Right to Access

A big part of this project and of defining the parameters for Inuit data sovereignty will include the development of a more detailed framework that outlines clear protocols with respect to indigenous intellectual property rights, which identify the consents required to access and use high-value cultural information[57]. At minimum each community will have control and oversight of how the data collected is used, and will be supported by the KMN IT Manager through hands-on training, along with reference materials like the KMN Operating Manual.

[57] Smith, Diane E. *Governing Data and Data for Governance: The Everyday Practice of Indigenous Sovereignty*. Australia: ANU Press, The Australian National University, 2016. Page 131. Web. 10 Dec. 2018.

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The KMN will provide direction on how to collect, analyze and use the data to inform-decision making, improve program delivery, reporting, and evaluation that ties back to specific agreements between the KMN and local makerspaces regarding performance measurement, with a priority on supporting community-owned data. At this stage, data may be aggregated and de-identified so that anonymity is guaranteed, thus protecting release of data from a specific community

We recognize the importance of user safety on a community network. To keep both physical and digital spaces safe, the KMN will develop a code of conduct as part of the operations manual as a resource for every makerspace to modify and implement. The user forum's content will also need to be centrally moderated periodically by the KMN IT Manager to make sure it is free of aggression or harassment, and are users abiding by the code of conduct.

Risks

Breach of security by staff or through insecure and vulnerable devices: We will prioritize staff training on privacy issues, set up confidentiality clauses as part of employment contracts and provide training for troubleshooting procedures to increase privacy settings of computers and devices. The technicalities in data collection need to be addressed through simplicity and training in the face of limited human capacity.

Users breach others users privacy: to mitigate this risk we will also provide training on how to use the network responsibly, as well as how to use adequate safeguards and practices. Additionally we will strictly require that everyone adheres to the privacy and code of conduct for both physical and digital spaces, highlighting and enforcing an environment of respect.

Cyberbullying: to mitigate the risks of cyberbullying we again, highlight an environment of respect and enforce our code of conduct, while at the same time integrating forum moderation into a staff position, most likely the IT Manager position at KMN. The moderator would be able to flag and take-down content that is deemed to be inappropriate, offensive or trigger-sensitive. At the same time, the te(a)ch curriculum contains a few modules on online and media safety that could be delivered by staff.

Chapter 7: Engagement

Inuit Cultural practice and the principals of Inuit Qaujimajatuqangit (the Inuit way of knowing) guide the Katinnganiq project in every step of its implementation plan and governance framework. These principles serve as guidance for our engagement philosophy, providing a check for our team who are both non-Inuit and Inuit, to ensure we are wrapping ourselves in a methodology that reflects the way Inuit have shaped the direction of their own success. These principals, when embraced as a core engagement philosophy ensure a process that will be collaborative and responsive to the needs of Nunavummiut. Specifically we root our engagement in the following principles:

Inuuqatigiitsiarniq (Respecting others, relationships and caring for people): At the core of any project centered around health, wellness and suicide prevention is a need to ensure that

respect and care for the people we're working with is centered at our engagement process. This means engaging in a care based model of listening, and challenging one's own assumptions of what is a 'best' or necessary approach.

Aajiiqatigiinniq (Decision making through discussion and consensus): From the beginning we have practiced acceptance in that we don't know the answers that will work for every community. The proposal that you are reading today was arrived at through lengthy discussions and involved collaborations between the four organizing partners, taking into account community feedback. Moving forward, the implementation and success of this initiative will require that discussion and consensus be placed at the heart of the decision-making process and govern the relationships between the KMN and each community. When engaging with partners and individual residents, our reliance on the principal of *Aajiiqatigiinniq* will mean we are first and foremost listening and adjusting our outcomes for each unique community and the vision they identify.

Piliriqatigiinniq/Ikajuqtigiinniq (Working together for a common cause); The challenge statement identified in this initiative is one that resonates throughout the Territory with all Nunavummiut. Throughout our engagements past and future, our focus will remain on working together for this common cause, understanding that a unified, collective and holistic approach will have the most impact.

Moving forward, the KMN will work specifically with each community through conversations with Mayors, Senior Administrative Officers and Hamlet Councils, as well as with Recreation coordinators and community residents of all ages to identify their strengths and desires. It will conduct consultations and environmental assessments with each community to develop an implementation plan that responds to their vision, resources, capacity and readiness. The success of local makerspaces and of this initiative as a whole will be built on meaningful dialogues and engagements that enable a community-led approach to systems change through Makerspace deployment.

The proposal that is presented in this document was shaped in significant ways not by one or two pivotal moments but through a series of meetings, phone calls and conversations between the four collaborating organizations that brought forth for discussion their particular mandates and areas of expertise. These discussions were informed at different points by feedback gathered from our outreach efforts. During the preliminary proposal stage, every community provided a support letter for the initiative, but one of the most important opportunities we had this year was the chance to present, in person, the vision of the Katinnganiq proposal to the Mayor's at the Nunavut Association of Municipalities Annual General Meeting in Cambridge Bay (which also coincided with Infrastructure Canada's site visit). After our presentation we heard feedback from Mayors that included the following:

- A re-assertion of the need for space for youth and youth services in their community, since in most communities the majority of people are young
- A desire to see these spaces engage Elders as well as Youth - and facilitate teachings between them; A need for physical space where Elders and Youth to come together, learn Inuit traditions and work together to help each other go forward.

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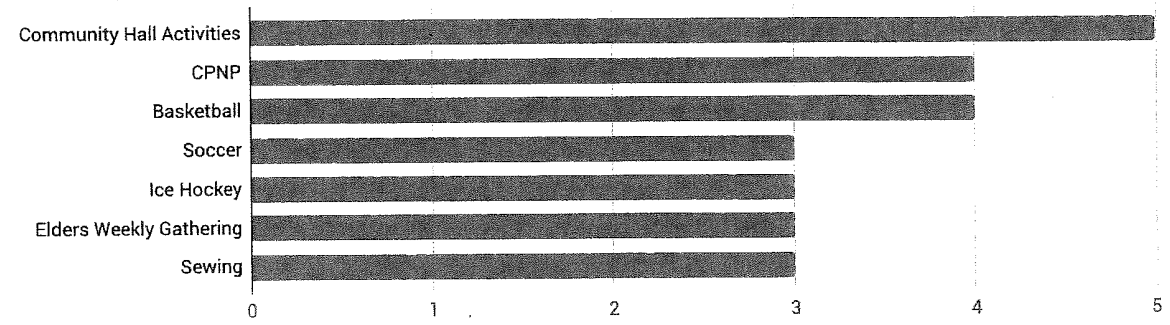
- A need for this initiative to reach the most vulnerable youth in every community - in terms of both space and curriculum - to give them a space to be and to learn. This is especially important for the pilot Makerspace in Iqaluit and the need to diversify inclusion approaches
- Curriculum must engage Elders and allow for Elder-led learning, on topics of their choice.
- Spaces need to address tool making between Elders and Youth, especially for hunting, and assist Elders in delivering those skills
- There is a need to teach Youth how to survive on the land, so there is a need to leverage technology for use on the land
- The proposal needs to expand definition of technology to include Inuit tools and skills
- That there is need to work together between communities - and that this project can be an avenue for working together
- That technology, curriculum, tools and learning environment needs to support language revitalization, to maintain the use of one's own dialect and support traditional knowledge

This feedback at the NAM AGM resonated with the internal conversations we were having, and became a framework for which to ground the proposal in. Throughout the following months, we've attempted to articulate the above and integrate this feedback into the vision of what a 'smart city' looks like in Nunavut.

Throughout the finalist phase we communicated by phone and by email with each municipality to share more information on the proposal, to request their input through a community survey, and to ask for a letter of support for the finalist phase. One of the other important opportunities for face to face consultation was when in January 2019, two members of our team travelled to Pond Inlet, Pangnirtung, and Qikiqtarjuaq to conduct consultation sessions with community members as well as with Senior Administrative Officials and Hamlet employees. In this trip, our team led a community session in Pond Inlet, but the rest of the trip was marked by adverse weather and travel conditions which delayed and cancelled flights, forcing them to reschedule travel plans. At the community consultation in Pond Inlet, 31 community members attended and provided answers to a set of four questions, which have been compiled below:

1. ***What general activities or wellness activities does your community already have?***

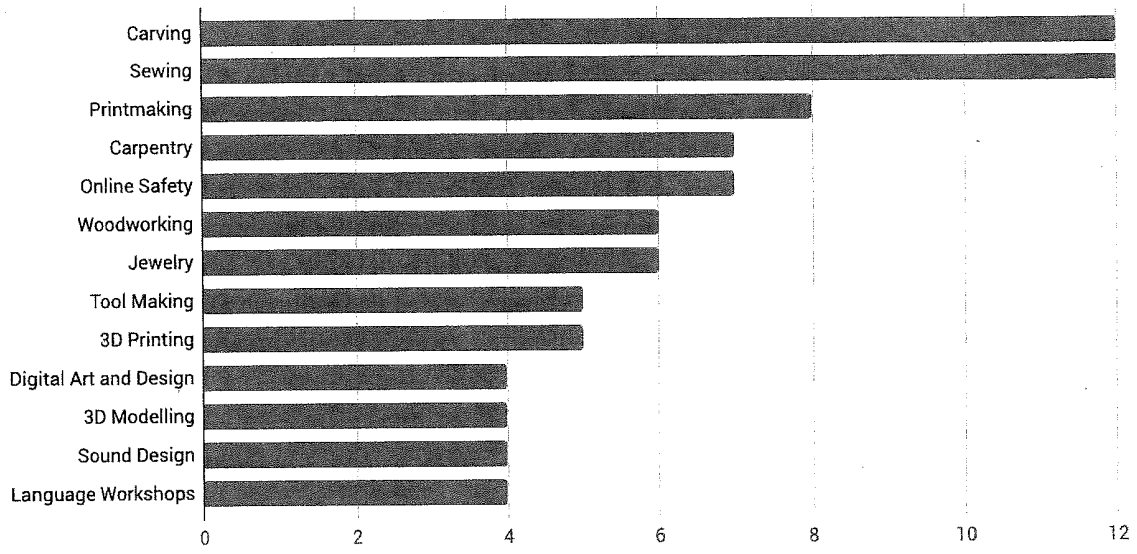
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Additional Answers

Volleyball (2) • Kids hockey (2) • Floor hockey (2) • Badminton (2) • Public arena (2) • Men's group (2) • AA meeting (2) • Indoor sports (2) • Pre-school (2) • Holiday square dancing (2) • Playing games (2) • Outdoor games • Game competitions • Tea party • Annual meetings for games • Prenatal • Art • Community wellness centre • School • Dances • After-school programs • Hunting and learning survival skills • All season hunting • Family grieving, healing • Fishing competitions • Science camp (summer) • Need more showing art and making Amauti

2. What are activities for wellness that you want to be doing?



Game Design (3) • Digital storytelling (3) • Computer Fundamentals (3) • Games (2) • App Development (2) • AR/VR (2) • Art (2) • Design • Beading • Crocheting • Knitting • Making Amauti • Leather making • Photography • Tools, stones and a proper facility for safe and proper learning skills in livelihood and economic benefits • Drop-in centre for children and youth • Teach young children about the dangers of drugs • Out on the land, hunting • Anything that includes training • Fishing • More activities for kids (6-10 year olds) • Homemade clothing to sell or something useful • Small engine repair training • Youth engagement with the land and parks • Language training for both Inuit and non-Inuit • Supper-making for children and youth (bringing home ingredients and left-overs)

3. What would you like to see be part of a makerspace in your community?
Theater (2) • Swimming (2) • Youth centre (2) • More public space to gather • Coffee • Office administration skills • Life skills • Cooking • Need house or workshop to do most of the above • Blacksmiths • More general activities for the youth • Marketing skills • More funding that suits local needs for betterment of the beneficiaries • Sewing • Printing art • Traditional Inuit stories made into cartoons • Getting ready for jobs for youth (how to make resumes, how to be prepared for a new career) • Making traditional clothing with youth • Youth involved with adults who are willing, and learn from them and the skills they have • Teach teenagers how to make homemade stuff • Carving • All ages learning something together • Storytelling • Courses on heritage and history • Making resumes • A shack and more staff • More public space for children and youth • Young people telling stories in their community

4. Do you have a skill that you would like to teach, support and mentor youth with?
Sewing (4) • Out on the land programs (2) • Yes, to tell and to show • Photography • Arts • Carving skills for over 18 years • Marketing art • Quarrying stones • Safety skills • Making Amauti and Parkas • Exploring patterns of clothing • How to work with leather (but no tools, etc) • Hunting, Fishing • Baking • Different kinds of design for hats, parkas, mittens and kamiks • Skinning seal and polar bear skin • Counseling and Healing • Talking with youth • I would like to learn too • We need to learn more

This information is part of the community level consultation that will be continued throughout the implementation of the initiative and inform each community's vision for their makerspace.

Another engagement opportunity we had was regarding Elder-led curriculum development. In Nunavut, Elders have said that strong relationships are the most important factors in child development. The *Inuit Qaujimajatugangit (IQ Principles)* identify a set of values and beliefs which they feel are critical to positive personal development, as well as essential guiding principles essential for all Inuit. Over the course of one week, our curriculum development team from Pinnguaq Association and QHRC travelled to Arviat, NU to meet with the Aqqiumavvik Society to discuss the process of developing Inuit-specific culturally-based curriculum based on the principles of *Inuit Qaujimajatuqangit*.

Over the course of of this week our curriculum development team met with Shirley Tagalik, Joe Karetak and Elder Louis Angalik to learn about Inuit Qaujimajatuqangit Education Framework, and did a land trip with the Arviat Young Hunters Association and the Smart Ice Programme[58]. They also met with local business owners to learn how they are using technology. This included Eskimo Point Lumber Supply (a local hardware and construction and maintenance business), the Arctic Co-operatives Limited, Hunters and Trappers Organization, Kiluk Ltd. (a local business focused on the production of fur and leather clothing), and the Hamlet of Arviat.

Lessons learned include the re-assertion that every community has their own unique needs and approaches to education and that curriculum development must be Nunavut-Inuit focused, and implementation must be responsive to the differing needs of each community. It not only helps preserve important knowledge and tradition, but also provides an Inuit

[58] *SmartIce is an award-winning technological innovation for the North, it's the world's first climate change adaptation tool to integrate cultural knowledge of sea ice with advanced data acquisition and remote monitoring technology to study climate change. This was a great example of an organization that works with local experts.*

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perspective on personal growth and development, and how we relate to each other, to other living beings, and to the environment.

In the past few months we have also onboarded an Advisory Committee to provide feedback on the proposal as it was being developed. There were 7 members of the Advisory Committee included: Kathleen Gomes (First Nations Bank), Alisa Praamsma (Mental Halth Commission of Canada, Lynn Stevenson (Canadian Foundation for Healthcare Improvement, Mara Grunau (Centre for Suicide Prevention), Charlotte Borg (Board of the Nunavut Kamatsiaqtut Helpline), Jesse Mike (Nunavut Literacy Council), and Joshua Nash (Canadian Federation of Medical Students). The Advisory Committee met twice through teleconference. The first meeting was on November 19th, 2018 which presented the revised vision of the proposal. The second meeting took place on January 22nd, 2019 which presented progress done to date. In both cases the Advisory Committee was able to provide feedback and resources for continued development of the proposal.

In general, our project engagement focused on three major strategies, all three of which will continue as the project moves forward.

- Territorial Gatherings

Getting together representatives of all 25 communities in Nunavut is an expensive and rare thing, but a few key events throughout the year allow the Katinnganiq team to share and request feedback on the project. The major gathering for consultation at the municipal level was the NAM AGM. With the participation of NAM on the board of the KMN, this will continue to be an important meeting moving forward to be able to report, request feedback, and have face-to-face conversations with Mayors and Senior Administrative Officials to address any collective action to be taken. Additionally, the KMN will seek to be present at other gatherings such as the Nunavut Economic Developers Association annual meeting to engage face to face whenever possible.

- Community Engagement

In the development of this proposal, engaging with community members at large in community visits were an excellent method to talk to individuals and learn about what they would like to see as part of this initiative. These opinions will shape the vision for their local makerspace as it is being developed. At the same time, one-on-one meetings with Hamlets were productive in understanding the intricacies of each one's unique situation, and will be necessary for the planning and implementation of this initiative into the future. With a governance framework that includes the broad representation of municipalities, Inuit organizations and leaders in both the public/private sectors of each community we will continue to build on consultations and engagement as a necessary and essential part of what this project hopes to achieve.

- Technology as a Connector

Already Nunavummiut are utilizing technology to share and expand their cultural practices, and the Katinniganiq project will leverage those existing uses for engagement in the

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project. Facebook is a good example, with high usage in the North. Our engagement strategy includes a heavy use of Facebook and social media, along with our website as important information and outreach tools.

Though our experiences have been positive so far, consultation does not come without criticism. It is important to note that the constructive feedback we received, along with lessons learned through our team's experience, be processed and utilized to better improve our efforts. For example, though the spaces proposed in this initiative are intended to be led by and serve Inuit communities, it has been vocalized by leaders that these spaces need to include the most vulnerable sectors of each community, including individuals from low-income households, those who are un or underemployed, individuals who have not graduated from high-sch individuals who are differently abled. To address this, it should be important to make sur outreach and access is continuously part of the administrative process, and that accessib and inclusivity be integrated by design into both the physical spaces and the technologie utilized so that inequalities are not exacerbated or maintained.

With regard to accessibility, and underscoring that a part of this initiative concern language revitalization, it is important to acknowledge the role of language and unilingu speakers. Throughout the engagement processes of this initiative, we have developed ou materials in both Inuktitut and in English, as well as relied on live interpretation when ne

Another important point that has been made is the need to support economic development and career opportunities in the territory through the funding that is made available by this prize or other fundraising initiatives. To address this, it will be necessary for the planned incorporation of the KMN organization (that will manage the smart cities and other funds) to be based in Nunavut and hire Nunavummiut, prioritizing Nunavut Land Claim beneficiaries. At the same time - the KMN will fulfill its role to support training for local staff and integrate capacity building through its services.

Risks

This is a project of immense magnitude that is faced with particular obstacles in terms of access to technology, distance, and human resources to coordinate communications and engagement. Below is a description of some of the major risks we have identified for engagement, along with the mitigation strategies we will be incorporating:

Restricted Communication Channels: Every community and every individual experiences things differently and no one mode of communication can be taken for granted. Our teams understands the value of a multi communications approach and will focus on ensuring engagement can be done equally through community radio, social media, email newsletters, and personal engagement, with a priority on written and verbal content in Inuktitut.

Distance and Travel: Travel to each of the 25 communities is incredibly expensive for anyone in the territory. While engagement will be ongoing and regular with a budget for necessary travel from a base in Iqaluit, this project prioritizes a community-led approach supported with training and digital communications to collaborate and achieve results.

High Turnover/Skills Capacity: Staff Turnover in Nunavut is always high as people move from opportunity to opportunity. Maintaining consistent staff and building capacity in each community to see these projects through will be a constant challenge. Throughout the proposal, our approach includes training and capacity building for both participants and staff through a 'Train the Trainer' model - and budgets to prioritize well paid employment opportunities.

Feedback integration: Consultation and engagement yield important feedback for project managers and leaders to consider - yet there is always a risk that feedback provided won't be incorporated into project design and implementation. We will strengthen a community-led process, with individual Hamlets, local organizations and community members as the ultimate decision makers with the power to integrate aspects of the proposal that have not been considered.

Chapter 8: Implementation

The jurisdiction of this entry into the Smart Cities Challenge is governed by the the Nunavut Land Claims Agreement and represents an Inuit population of 84%. This section will lay out how the implementation of this initiative will be built in alignment with the articles of the Nunavut Lands Claim Agreement, alongside the values of Inuit Qaujimajatuqangit. The principals themselves are intuitively compatible with duties to consult, employment benefits and respect for the land through a process that complies with all our requirements under global, federal, territorial, municipal and Inuit law.

Duty To Consult with Indigenous Groups

As detailed in Chapter 6 on Engagement, the duty of the Katinnganiq proposal to consult with our communities is a central piece for the implementation of the project. NAM, as the lead proponent for this initiative is key. The group provides a single voice for mayors and municipal administrators of the territory's 25 communities. NAM leads this duty to consult at the highest level, working daily with municipal leaders on every decision and soliciting feedback throughout the process. The association was formed to make important contributions to decisions about Nunavut communities and capital projects, with Katinnganiq fitting naturally into that discussion. As noted in the Engagement chapter, we lean heavily on Aajiiqatigiinniq (decision making through discussion and consensus) which means that the duty to consult extends beyond just this initial phase of the development of a proposal and is a core value that spans the entire project.

Modern Treaty Obligations

Nunavut sits on the largest settled land claim in the entire world. The respect for the terms of that land claims agreement will be a core tenet of the implementation phase. Given the size and scope of this proposed project and the source of the funding, this project as a whole and the proposed KMN organization in particular will adhere to the articles of the

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Nunavut Land Claims Agreement[59] as they relate to the project's implementation. There are certain obligations under the NLCA that are relevant to this project. They include;

Article 23: Inuit Employment Within Government[60]: While this article directly relates to employment within the Government, Katinnganiq is committed to support and encourage a workforce that is reflective of the population it serves by prioritizing Inuit in leadership positions and building capacity for emerging and young leaders. We will develop an Inuit employment plan that specifically focuses on training and support in the ICT sector, along with training in administration, bookkeeping, management and program facilitation - with both digital materials and in-person delivery.

In addition to the types of education and employment plans that stakeholders organizations in this project already have in place, we developed employment strategies modeled on the Government of Nunavut's own hiring policies which put priority on Inuit hiring and are rooted in Part 4 and 5 of Article 23 of the Inuit Employment Plan.

Article 24: Government Contracts[61]: This Article will govern how the KMN project commits to administering and distributing any government funds. We will actively seek out and encourage Inuit firm involvement as primary partners in delivery, and support local businesses. While much of the NLCA is designed to discuss the interaction between Inuit and various levels of Government, the spirit of the agreement remains relevant and vital to what we are aiming to do. Respect for the NLCA in the implementation of the Katinnganiq project is paramount.

Community Employment Benefit

Implementation of this initiative will adhere to and complement the CEB as outlined by Infrastructure Canada. Our implementation of the Nunavut Land claims Agreement will address both employment and procurement opportunities for Indigenous peoples (specifically Inuit) and Inuit firms throughout the life of this project. At the same time, we will encourage and support the participation of women (and Inuit women in particular) in leadership positions influencing both the design, management and delivery of programs.

At the same time, our proposal carries with it a strong emphasis on capacity building programs for youth, which will be more concretely integrated into career opportunities through internships programs with the KMN and within each community. The Pinnguaq Association will support internships (where applicable and in-line with eligibility criteria) through the delivery of the Digital Skills for Youth internship wage-matching program it administers on behalf of ISED. Other wage-subsidy programs (like those that exist as part of Canada's Youth Employment Strategy, and the Kakivak Association), will be sought after to support internships, mentorships, apprenticeships and youth leadership.

With at least 5 staff positions at the KMN not for profit, and 2 positions at each Makerspace, along with possible interns, this initiative has the potential to create a significant amount of employment opportunities and economic development in the territory. While the

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[59] "Nunavut Agreement." *Nunavut Tunngavik Incorporated*. N.p., n.d. Web. 12 Dec. 2018. <https://nlca.tunngavik.com/>
[60] "Nunavut Agreement: Article 23." *Nunavut Tunngavik Incorporated*. N.p., n.d. Web. 12 Dec. 2018. <https://nlca.tunngavik.com/?page_id=2301>
[61] "Nunavut Agreement: Article 24." *Nunavut Tunngavik Incorporated*. N.p., n.d. Web. 12 Dec. 2018. <https://nlca.tunngavik.com/?page_id=2366>

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Makerspace and te(a)ch program both host content targeted at adults, it is designed with K-12 youth in mind. Some of the most prevalent feedback we've received in our community consultation was around the need for consistent and positive youth programming. Coupled with our focus on health and wellness, this project is well positioned to provide that.

The very existence of the proposed program and the infrastructure it will create serves as a boon to small and medium businesses, as well as social enterprises. Already in the six months since the Iqaluit Makerspace opened we have welcomed in small businesses and shared both what we can offer to them, but more importantly, what they can offer to our attendees. This project is about supporting the already vibrant culture of innovation in the territory.

As it relates to reporting on these statistics and the stories that accompany them, Katinnganiq is committed to expanding on them as part of the performance measurement framework outlined in Chapter 3.

Chapter 9: Financial

This chapter provides a detailed financial breakdown of a five-year implementation plan for this initiative. In serving 25 unique communities, we recognize that the prize of $10 million dollars will not cover the costs of independently opening and sustaining fully realized makerspaces in 25 communities throughout five years. The prize of $10 Million will be a substantive amount that will help launch this initiative, but as has been the focus throughout this proposal, the end goal we seek is one of financial sustainability beyond the timeline of this grant, predicated on a multi-level collaborative framework that breaks down silos and harnesses community, territorial and national efforts and capacities to support the outcomes of this project.

The KMN's role in this sense is key to attracting more funding from municipal, territorial, federal and private/corporate dimensions, and integrating this support while working with each community to create local capacities for the long-term maintenance of community makerspaces. With the mission to serve each community, we have included those projections into the design of a 5-year budget plan that allocates the $10 million dollars in start up costs for both the KMN Not For Profit, as well as for 24 individual makerspaces[62], in a phased sequence, spread out as follows:

- FY 2019-2020: KMN Not-for-profit, 4 Makerspaces
- FY 2020-2021: KMN Not-for-profit, 5 Makerspaces
- FY 2021-2022: KMN Not-for-profit, 5 Makerspaces
- FY 2022-2023: KMN Not-for-profit, 5 Makerspaces
- FY 2023-2024: KMN Not-for-profit, 5 Makerspaces

This phased approach will see implementations in each community in ways that respond to their resources, capacity and readiness, with the KMN allocating the funds accordingly. In this budget, estimates are allocated each year to a group of 4 or 5

[62] *The Iqaluit Makerspace has not been budgeted for because start-up funds have already been directed to it from the preliminary application grant, and though it will remain part of the Katinnganiq Makerspace Network, it will be managed and funded by the Pinnguaq Association.*

communities (depending on the year) for start up costs, with the projection that in subsequent years, Makerspaces will be running with additional funding provided collectively by local municipalities, a local organization, as well as by KMN funds obtained through additional fundraising efforts beyond that of this prize. The estimates included in this budget are based on the following assumptions:

Salaries

Due to the high cost of living in Nunavut (high housing rents, high cost of food, and high utility costs), an average salary in Nunavut needs to adequately reflect a living wage. According to payscale.com an average salary in Nunavut is $72,715[63], while an average salary at the GN is $99,000[64](not including staff housing). To remain competitive, KMN and local Makerspace salaries are budgeted to receive market rate salaries that correspond with their duties and responsibilities, and their respective FT or PT commitments. For the first year, salaries have been prorated with the assumption of a September start date

KMN Operations Manual

As a new not-for-profit organization providing ongoing support, the development of an operations manual will be an essential tool for its success, and the success of local Makerspaces. It will outline managerial, financial, and administrative processes, develop statement of values, ethics and operating principles, internal and human resources policies, and others as outlined in the project management chapter. We have budgeted $30,000 in smart cities award costs to hire an experienced consulting firm, along with $20,000 in in-kind labour from the 4 collaborating organizations to produce these deliverables in a reasonable timeframe.

Rent and Utilities

Though office space in most urban centers is high, the context in Nunavut also includes the added challenge of scarcity. Available spaces are scarce, and as much as we will work to combine resources wherever possible, we have projected an annual rent of $60,000.00 (or a monthly fee of $5,000.00) in each community (based on the rent paid for the Iqaluit Makerspace from August 2018 to February 2019). For the first year, rent and

[63] "Average Salary in Iqaluit, Nunavut, Canada." *PayScale*. N.p., n.d. Web. 27 Feb. 2019. <https://www.payscale.com/research/CA/Location=Iqaluit-Nunavut/Salary>
[64] "Average Government of Nunavut Salary." *PayScale*. N.p., n.d. Web. 27 Feb. 2019. <https://www.payscale.com/research/CA/Employer=Government_of_Nunavut/Salary>

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utilities costs have been prorated to 75% of the full costs to account for the timing of Makerspace deployment in the late summer, early fall.

Internet

The internet context in Nunavut has been addressed throughout this proposal and more specifically in the technology chapter. Independent of our initiatives, each makerspace will offer a wireless internet connection purchased by one of the Internet Service Providers available in each community. For example, SSi Micro/Qiniq offers Internet Plans in every community of 150Gb at 5Mbps for a monthly fee of $399.00, before tax; and over usage prices of $120 per 10Gb. Northwestel is not available in every community just yet, but are mandated to offer their services in all communities by the end of 2019 through Telesat's new Ka-band high throughput satellite. Right now, in Cambridge Bay or Iqaluit for example, their monthly plans for 100Gb are priced at $129/month before tax, with over usage fees at an extra $4/Gb. We have budgeted an average annual fee of $4,800 (or $400 monthly) for enough bandwidth to support Makerspace users in each community. Though we see these fees adapting with the changing connectivity landscape over the next few years.

Travel

Travel to and within the territories is prohibitively expensive. Nunavut's land area is 1,936,113 sq. km (or 20% of Canada's land mass), with 25 fly-in only communities. For example, one return flight from Iqaluit to Ottawa in September of 2019 costs, at the lowest price, $1,585.00[65]. Airfare from Iqaluit to Cambridge Bay costs approx $3,448.00 and a ticket from Cambridge Bay to Kugluktuk is priced at $1,704.00. An annual budget of $50,000 for the KMN Not-for-profit will be able to support consultation, implementation and performance measurement.

Evaluation

Evaluation is a key aspect of measuring the performance and outcomes of this initiative. We have budgeted for a bi-annual independent evaluation to be undertaken in accordance with funder requirements to assess the performance of this initiative as a whole. Simultaneously, in the first year we have budgeted $25,000.00 for the development of a comprehensive evaluation framework that will work with communities to further develop the key performance indicators that have been set out in this proposal, along with the development of the evaluations tools and materials appropriate to this context.

At the same time we have budgeted annually to carry out data collection, analysis and reporting

Curriculum Development, Facilitation and Training

[65] *Flights priced through Expedia.ca on February 27, 2019 for travel between September 17 - 29, 2019.*

Much of the curriculum development involved in this initiative has and is being produced by the Pinnguaq Association, with funding confirmed from other granting programs (such as ISED's CanCode and Digital Literacy Exchange Programs), as well as through support from various partners. As the curriculum and learning resources are expanded to serve this project and each community's needs, we anticipate that there will be a need to adapt and create materials that respond to a specific demand. With a focus on digital literacy for adults as well as Elder-led curriculum, Pinnguaq will leverage its resources to support this initiative - while responding to the demand of its services with smart cities funds where needed through nominal fees.

The Embrace Life Council staff will provide training in ASIST and Trauma-informed practice for Makerspace staff. Based on their registration and facilitation fees, we have budgeted $5,000 per training session, per community.

KMN Digital Network Architecture

The development and deployment of the Network Architecture has been quoted at $70,000.00 for its development and deployment, with an additional $10,000.00 quoted for the preparation of curriculum and learning materials regarding its management and maintenance.

Startup Materials

Each Makerspace will require a set of startup materials to run its programs. With the assistance of programs like Computer for Success Nunavut, Computers for Success Canada, and Computers for Schools we can provide in-kind refurbished government laptops to each space. A selection of additional materials that will be essential for running programs include high capacity desktops, VR headsets, VR Camera, high end 3D printer, 3D scanner, inkjet printer/cutter, document cameras, speakers, DSLR cameras, video cameras, speakers, art supplies, hand and carving tools, books, robotics tools (dash and dot), and electronic learning materials (Makey Makey sets, Lego Mindstorms, Elenco Snap Circuits, MicroBits, Raspberry Pi's, and Arduino, along with other basic materials, like conductive thread, wires, LED lights, etc). With a budget of $40,000 for start up costs, each community space, with assistance from KMN can procure the tools and materials that are right for them.

Internet Exchange Points (Arctic Internet Exchange)

The cost of an IXP Nunavut is primary based on the accessibility to a data centre. If the GN or one of the ISPs (Northwestel or SSI Micro) will donate or rent Arctic Internet Exchange space in their data centre, the setup costs can be as little as $10,000 in each community. If a data centre is required, the most cost effective option will be one of Nuvujaq's □2 data centres, which will cost roughly $200K including installation. Nuvujaq will have a data centre in Iqaluit (funded through other means) this spring and has another data centre available to deploy in the community makerspace. At the same time, the

equipment needed to setup an IXP at a data centre (1 switch, 2 routers) is priced at $10,000 for each setup. Additional IXP setup labour and training delivery will cost $10,000 per instalment.

Other Sources of Funding

The Finance Committee of the KMN Board, along with the Executive Director, the Finance Director, and the Development Coordinator the KMN will be an organization capable of fundraising to further support this mission at the federal, and territorial levels, while also working with the private sector. Expressions of interest from non-government funders have been positive. We have had a positive rapport with the Internet Society and CIRA, both of whom have funding programs. We have relationships with Google and Microsoft, and will also be pursuing funding from RBC Future launch and TD Ready Commitment. We will also be pursuing wage matching internship programs from Kavikak Association, or the Digital Skills for Youth program (administered by Pinnguaq association) and the Technical Work Experience Program (TWEP), which is administered by Computers for Schools (CFS) and part of Canada's Youth Employment Strategy.

In general, with funding for a Finance director and fundraiser, we will be utilizing an accrual method of account, performing annual audits, and building a fundraising campaign to further sustain this initiative beyond lifetime of this grant.

Risks

The major financial risks of this project rests in being able to secure the support from other sources of funding to be able to provide a sustainable path forward for each community makerspace. The mitigation strategy for this major risk factor is addressed throughout this proposal, and it includes a strong vision, governance framework, and project management strategy (including performance measurement) that builds in costs for fundraising and development. The strong leadership and management of the KMN will centralize fundraising to further support local Makerspaces, while also assisting in applying for and sourcing funding at the local level.

Finalist Grant

Smart Cities Challenge		Report on $250K Grant to March 2018
	Total	**Details**
Outreach Coordinator Salary		
Outreach Coordinator Salary	$38,000	*Chelsea Singooriee/Nunabox Media*
Subtotal	$38,000	
Outreach + Consultation		

Room booking fees, door prizes, snacks + refreshments for community sessions + live interpretation fees	$3,120	*Bookings and Cancellation fees at Pond Inlet, Pangnirtung and Qikiqtarjuaq*
Subtotal	$3,120	

Travel, Accomodations, Per Diems		
Travel to Iqaluit, Pond Inlet, Pangnirtung, Qikiqtarjuaq communities for outreach	$11,380	*Team of 2 people*
Travel to Jury Presentation	$4,200	*Pinnguaq, ELC, + QHRC (1 rep each)*
Travel to NAM AGM	$6,800	*Team of 2.5 (1.5 of team financed through Pinnguaq)*
Travel to Arviat for Curriculum Development consultation	$5,000	*(some additional fees also supported by Pinnguaq)*
Travel to Ottawa for CIRA/IXP meeting	$2,925	*Team of 2 (Pinnguaq + QHRC)*
Subtotal	$30,305	

Marketing		
Website	$4,000	
Branding	$1,500	Nunavut Artist hired for logo design
Communications/Advertising/Design	$2,800	
Subtotal	$8,300	

Translation		
Translation of project brief	$1,200	
Translation of press release	$1,200	
Translation of preliminary proposal	$3,475	
Translation of brochures, website and other outreach material	$2,600	
Translation of Final Proposal and Video	$7,000	Budget for Translation to be done after March 5th
Subtotal	$15,475	

Pilot of Mesh Network		
Equipment	$3,000	
Research		in-kind Fleming Student project
Coordination of Fleming students	$2,000	
Subtotal	$5,000	

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Administration		
Administration overhead	$27,000	$6,750 for each of the four partner organizations
Advisory committee	$2,800	*$200 fee per meeting per Advisory Committee Member (7 members total)*
Subtotal	$29,800	
Final Proposal Development		
Research and Proposal Development labour	$30,000	
3rd Party Consultants fee	$30,000	*Hired Consultant Team*
Subtotal	$60,000	
Makerspace Pilot		
Rent, Utilities	$30,000	*$5,000 a month for 6 months*
Basic furnishings		Pinnguaq in-kind
Hardware (computers)		Pinnguaq in-kind
Staff Salaries contribution	$30,000	*Pinnguaq supported most salary costs in-kind*
Software/Tools		Pinnguaq in-kind
Subtotal	$60,000	
TOTAL	**$250,000**	

The months of preparing this proposal with support of the finalist funding was a mix of practical research and development, along with the installment of a pilot Makerspace in Iqaluit, and travel and consultation. The $250,000 provided for the finalist phase was used consistently with the budget proposed with one major change, and adjustments for actual scope of expenditures. The major adjustment was in the redirection of funds budgeted for mesh network research and implementation, to the hiring of a consultant firm to assist in the writing of the final proposal. What follows is a description of the funds that were spent.

Outreach Coordinator: $38,000

An outreach coordinator for the project was hired in early November 2018, bringing on Chelsea Singoorie of Nunabox Media to the project. Chelsea, a trilingual Inuk from Pond Inlet brought a knowledge of not only the communities we were visiting as apart of this project but

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also extensive community development experience through her experiences with Nunabox. Chelsea travelled across Nunavut hosting consultations and helping craft the final project based on the feedback of those we met with.

Outreach and Consultation: $3,120

Originally, a budget line of $15,000 was created specifically to provide funding for participation in our consultation. This included to pay for room bookings, the purchase of prize giveaways for our consultations and honorarium for specific consultations. Creating incentives for participation is a standard practice in Nunavut consultation and this budget was expended in that fashion, however, it was significantly reduced due to the limited time for travel, concurrent with the writing of this application for our staff.

Travel: $30,305

Nunavut is the most expensive place to travel in Canada, with some community visits running close to $10,000 for a two day session. The $40,000 in the travel that was originally budgeted was reduced due to reduced travel and the combination of additional funding through Pinnguaq's te(a)ch program to consultation and te(a)ch workshops We ended up being able to visit;

- Pangnirtung
- Pond Inlet
- Arviat and;
- Cambridge Bay

It also included funding for Katinnganiq members to consult at major meetings in Ottawa and Toronto both with the purpose of bringing on additional partnerships to help compliment the initiative.

Marketing: $8,300

Promotion of the initiative was vital throughout the process and this included the development of a website, a new logo for the initiative and Facebook/social media outreach. Facebook is the most popular form of communications in Nunavut and the purchase of advertising through the service was a key part of spreading the word to those that could not attend.

Translation: $15,475

Our primary audience for this project is Inuktitut speaking and a $14,000 translation budget was created to ensure that all project materials are available in Inuktitut. Our news, alerts, project briefs and project proposal documents are all translated and available in English/Inuktitut, as is the website.

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Pilot of the Mesh Network: $5,000

Pinnguaq partnered directly with Sir Sanford Fleming College in Peterborough, Ontario to bring on four students of the Wireless Network Technology program to explore Mesh Networks. These students, along with staff from Pinnguaq, conducted research on Mesh Networks, and some experiments to determine the value of bringing Mesh Networks to this project.

As is explored in this proposal, this research, along with input and expertise from Nunageek Solutions Inc and Nuvujaq, ultimately highlighted the flaws on any heavy reliance on Mesh Network in this proposal and this is why it has been scaled down so significantly.

Administration: $29,800

An Administration budget was created to cover the costs of the four key organizations involved. Nunavut Association of Municipalities, Qaujigiartiit Health Research Centre, Embrace Life Council and Pinnguaq all received $6,750.00 each to help cover administration of the project. Another $2,800 was put aside for the Advisory Committee to support their involvement.

Research and Final Proposal Development: $60,000

This funding covered the actual writing of the proposal. This primarily was absorbed in wages but also in the hiring of the consultant firm Nordicity who came on to help finalize the proposal.

Pilot Makerspace: $60,000

$60,000 was provided to the Pinnguaq Iqaluit Makerspace to help cover the costs of operating the space in 2018/2019 as apart of the pilot project. This included rent, utilities and wage subsidies. The space helped shape the direction of this project more than any other individual initiative. Pinnguaq contributed an additional costs for salaries, furniture, and materials between September 2018 and March 2019 to support the staff and the space itself.